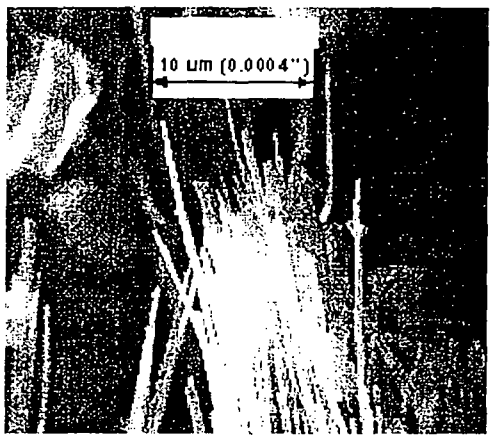
MARCOR REMEDIATION, INC.
HEALTH AND SAFETY PLAN
VERSION 1.1

SCREENING PLANT
OPERABLE UNIT 02
LIBBY, MT



Microscopic view of fibrous bundle in vermiculite
From the EPA website for Libby. Montana

Developed under contract no. DTRS57-96-D-00036, USDOT VOLPE
Developed by: Dan Figueroa, MARCOR Remediation, Inc.

Reviewed by: Bruce Lippy, CIH, CSP _____ 7-15-00 (date)

Seal

Procedure Number: 02-301-03

Procedure Name: Safe Work Practices

Effective Date: 02/01/97

Supersedes Procedure Number: 02-301-02

Responsible Positions: Health and Safety Coordinator, Operations Manager, Assistant Operations Manager, Technician, Project Manager, General Manager

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Objective: To reduce company losses and individual pain and suffering due to occupational injuries/illnesses.

PROCEDURE:

All field employees will receive a formal review of company safety policy and procedures in conjunction with safety training prior to initial assignment and annually thereafter.

All appropriate safety practices and regulatory requirements must be followed on all MARCOR job sites. Failure to follow safe work practices and/or regulatory requirements will result in disciplinary action up to and including termination. Any employee confronted with a truly unique situation in which proper safety practices could not be feasibly implemented is required to seek advice from the operation's Health and Safety Coordinator or other qualified individuals before commencing work.

The following considerations are to be used, by all MARCOR personnel, as a guide to safe work practices and must be adhered to on all job sites.

GENERAL:

- Smoking is prohibited within the enclosure or in the airlock system. Additionally, smoking is not permitted near or around combustible materials or supplies.

- Horseplay, fighting, gambling or possession of firearms, or other weapons will not be tolerated.

- Running or jumping from an elevated area is not permitted except in the event of an emergency.

- Do not use or cause to be used, any equipment that is not, in your opinion, in a safe condition.

- Any personnel driving or riding in a company owned vehicle or driving or riding during company time must obey all traffic laws, practice defensive driving, and wear seat belts.

FIRE EXTINGUISHERS:

- All MARCOR jobs must have, at a minimum, a 10 lb. rated ABC fire extinguisher (as posted on the extinguisher) for every 3000 square feet of work area. (NOTE: A ½" hose, equipped with a nozzle, may be substituted if substantial water pressure is obtained and the hose is able to reach all working areas).

- Fire extinguishers must be conspicuously located and free and easy access to the extinguisher must be maintained.

- Fire extinguishers must be routinely serviced by a professional organization and recharging must take place annually at a minimum or whenever the gauge indicates that recharging is necessary. It is the Supervisor's responsibility to request recharging if it is necessary before annual servicing.

- All MARCOR employees must be instructed on the proper use of fire extinguishers as part of the safety training program before their initial assignment and at least annually thereafter.

GAS CANS:

- Only OSHA approved gas cans may be used to store flammable liquids on MARCOR job sites. (Plastic gas containers are prohibited)

- Gas or flammable liquid containers must not be stored or used near high heat or any other ignition source.

- Smoking is prohibited near the storage of combustible materials or supplies.

- All employees must be instructed of the presence and location of the stored combustible liquid.

COMPRESSED GAS CYLINDERS:

- All compressed gas cylinders must be stored, transported, and used in an upright vertical position and must be properly secured to prevent the cylinders from falling over.

- All cylinders must have value protection caps in place at all times, except during use.

- All cylinders must be stored and used in areas away from oil and grease. Cylinder caps, valves, couplings, regulators, hoses, and apparatus must be kept free of oily or greasy substances and shall not be handled with oily hands or gloves.

- Oxygen cylinders must be stored at least 20' away from cylinders or containers containing flammable substances.

- Refer to MARCOR Procedure #02-140 on Compressed Gases.

WELDING/CUTTING:

- Only employees with demonstrated ability, training, and knowledge shall be permitted to conduct welding/cutting operations.

- Oxygen/acetylene equipment must not be used in areas in which sparks may ignite any adjacent material.

- Oxygen/acetylene tanks shall be stored/used in areas away from the cutting/burning operation in which sparks or heat will not possibly come in contact with the cylinders.

- Fire extinguishers must be available during cutting/burning operations.

- Refer to MARCOR Procedure #02-303 on Welding, Cutting, & Other Hot Work in Hazardous Locations.

EMERGENCY EVACUATION PLAN:

- All MARCOR job sites shall contain an emergency evacuation plan including the following points:

A. Identification of available exits in the event of an emergency;
B. Emergency exits must be marked and clearly visible;
C. Where exits are not visible from a remote area, exit arrows must be placed on the walls pointing to the nearest exit (this can be accomplished with duct tape, marker, or spray paint and should be placed approximately three feet from the ground);
D. The establishment of a designated meeting point in the event of an emergency situation;
E. Communication of each particular job's emergency evacuation plan to all employees at the start of each job.

- Refer to MARCOR Procedure #05-465 on Fire and Emergency Evacuation Plan - Asbestos.

ELECTRICAL SAFETY:

- All exposed electrical circuits must be considered live until proper testing proves otherwise.

- All electrical conductors in which a person may come in contact with during the course of work must be tested before work is initiated around such conductors.

- If electricity needs to be shut down for safe work, MARCOR's Lockout/Tag Procedure #02-305 must be followed whenever possible. If it cannot be followed and if an electrical circuit is shut down by means of a breaker, fuse or switch, that point (as well as any other point that could energize the circuit in question) must be clearly labeled with the following warning to alert people to the fact that energization could cause injury or death:

WARNING
PEOPLE WORKING
DO NOT ACTIVATE POWER
DATE

- Multi-lingual job sites must have warning signs in English as well as any other languages represented on the job sites.

- Electrical cords in the work area must be protected from accidental damage.

- Cords should be elevated to reduce potential internal damage from pedestrians or equipment traffic as well as possible "pinch points".

- Equipment (ex. - scaffolds, negative air units, etc..) must not be permitted to roll over extension cords.

- Extension cords and all electrical equipment shall be checked regularly for damage or missing ground pins. Cords and equipment demonstrating such flaws must not be used and shall be tagged and returned to the warehouse for repair or replacement.

- All equipment, in which energization could cause potential injury, must be locked out to prevent energization at points of activation.

- Extension cords should never be fastened with staples, hung from nails, or suspended by wire. Duct tape is an acceptable alternative.

- Care must be taken to avoid the accumulation of water on or around electrical equipment.

- Water must never be sprayed directly on electrical outlets, junction boxes or any other electrical sources of electrical equipment.

- All areas in which water or water vapor may come in contact with a live electrical source must be appropriately and completely sealed.

- Employees working around energized wiring or equipment in which electrical exposure may occur, must be supplied with and wear heavy insulated rubber boots and gloves.

- Metal ladders must not be used in areas in which electrical hazards are present and pose a risk to the safety of MARCOR employees. Special care must be taken with any overhead wires to not get within 5 feet.

- All electrical equipment must be connected to an appropriate ground fault circuit interrupter (GFCI) at a point closest to the source.

- Portable electric hand tools should be equipped with a 3-wire cord having a ground wire permanently fixed to the tool frame or should be of the double insulated type and labeled as such.

- Refer to MARCOR Procedure #02-320 on Electrical Safety Practices.

UNPROTECTED HIGH WORK:

- Life lines, safety belts or harnesses and lanyards, or other appropriate fall arresting devices shall be provided to and worn by all MARCOR personnel when an unprotected falling hazard exists.

- Fall arresting devices shall be installed to a substantial member and in no instance shall an employee be subjected to a fall in which the fall arresting device will not secure the individual to within a 3' vertical fall.

SCAFFOLD SAFETY:

- All mobile scaffolding must be fully planked for the full width and length, except for necessary entrance and exit points.

- No employee will ride a mobile scaffold unless the following conditions are met:

  A. The floor is within 3 degrees of level;
  B. The floor is free from pits, holes or other obstructions;
  C. The minimum dimension of the base is at least one half of the height; and
  D. All tools and materials are secured or removed.

- All scaffolding 4' and higher shall have guard rails (approx. 42" high) and mid-rails on all open sides and ends.

- Scaffolding 10' and higher shall have 4" toeboards on all open sides and ends.

- The height of rolling scaffolds shall not exceed 4 times the minimum base dimension.

- Employees riding on rolling scaffolds shall not mobilize scaffolding by grabbing overhead members and pulling the tower along.

- When erecting a scaffold system, the built in ladder must be continuous from top to bottom.

- Employees shall use only appropriate ladder systems to access or exit the scaffolding.

- Scaffold platforms shall be kept free of debris so as to insure a safe walking surface.

- All casters on rolling towers shall remain locked except during repositioning.

- Appropriate bracing must be incorporated on all scaffold systems.

- Refer to MARCOR Procedure #02-335 on Equipment Safety Guidelines - Ramps, Runways, Platforms, Scaffolds and Towers.

LADDER SAFETY:

- Ladders will be used to give safe access to all elevations.
- Broken or defective ladders will be tagged and removed from service.

- The use of a broken or defective ladder is prohibited.

- Standing on the top step of a ladder is prohibited.

- "Walking" ladders is prohibited.

- Ladder feet shall be placed on a substantial base and the area around the top and bottom of the ladder shall be kept clean.

- Ladders shall not be used in a horizontal position as platforms, runways or scaffolds.

- Side rails of portable extension ladders shall extend at least 36" above the landing.

- Portable ladders shall be tied, blocked or otherwise secured to prevent their being displaced.

SLIPS, TRIPS AND FALLS:

- Minimize excess water when working in wet conditions.

- Follow safety guidelines for use of safety lines and lanyards.

- Be careful when working and walking on top of large metal pipes and tanks.

- On approach areas, check for clearance and good visibility, especially when carrying objects that obstruct your line of vision.

- Watch out for areas of debris and clutter, especially under poor lighting conditions.

- Keep work areas well lit, and note locations of trench excavations, ground depressions, holes and objects of impediment to avoid tripping and stumbling.

- At a minimum and unless otherwise required, use rubber-soiled shoes with vibrand or rough sole finish.

- Protection of floor openings is *crucial*. If an opening is cut in a floor or wall, caution signs and proper barricades or covers that are tightly secured must be in place at all times unless you are physically working in the opening. Never leave an open hold unattended even for a few seconds.

- Clear work floor areas of electrical cords, cables, hoses within pathways.

- Avoid walking on hillsides of loose gravel, stones and rocks.

- Keep stairways clear. Avoid using stairways as storage or temporary location areas.

- After spills, immediately clear floors of oil, grease, soapy water and other liquids.

- NEVER jump from an elevated area. NEVER run on the job site (except in an extreme emergency).

- Do not ride" a mobile scaffold.

- Do not stand on the top step of a ladder.

- Make sure that the steps, ladders, handles and grab bars on large equipment are properly maintained and cleared of mud, snow and ice when getting on or off the equipment.

- Always exit a piece of equipment or climb down a ladder the same way you entered -- that is, facing the equipment or ladder.

- Always use the "3-point system" for getting on or off ladders and equipment this means you must keep 3 limbs in contact with the ladder or equipment at all times -- two feet and one hand or two hands and one foot.

- Never jump from equipment; never use wheel hubs or tires as a step; never use the door frame or the edge of the door as a hand hold; and never assume that the ground below is level. Always check it first.

HOUSEKEEPING:

- Good housekeeping on the job is **MANDATORY** and every employee is responsible for keeping the job clean for safety and efficiency.

- Poor housekeeping can lead to many kinds of losses such as damage to materials, structure, and equipment; loss of productive work time needed to work around trash and disorganized storage of materials; fires; and all kinds of injuries, including: punctures due to nails in boards; twisted ankles; trips/falls; particles in the eyes.

- All non-regulated trash, waste and scrap shall be placed in proper containers. Clean up scrap as you work. All asbestos and/or hazardous waste should be placed in the designated receptacle(s).

- All stairways, corridors, ladders, catwalks, ramps, and passageways MUST be keep clear of loose material and trash.

- Work areas shall be adequately lit.

- Place rags which have been saturated in flammable liquids in approved covered metal containers.

- Wipe up spilled liquids immediately. If you can't handle the problem, notify your Supervisor.

- Do NOT leave tools and materials where they will create a hazard for others. NEVER leave tools lying around on scaffolding or platforms.

- Store all materials to be used on the job neatly. Return all surplus materials to the stockpile at the completion of the job.

- Keep all hoses and electrical cords suspended whenever possible.

PERSONAL PROTECTIVE EQUIPMENT:

- Approved safety glasses are required while working on all jobs in which there is a potential for eye injury. Full face piece respirators satisfy this requirement.

- Hard hats must be worn when there is danger of an employee being struck by a falling object.

- Protective gloves must be worn while using a razor knife, removing chicken wire, or whenever there is a risk of injury by burning, laceration, puncture, or abrasion.

- All field employees are required to wear standard work boots or shoes while working.

- A respirator may be worn anytime an employee wishes to insure his/her air quality. Respirators must be worn at the direction of the supervisor and/or within the work area during abatement procedures.

- Tyvek or chemical protective suits must be worn at the direction of the supervisor and/or during abatement procedures.

- Refer to MARCOR Procedure #02-101 on Respiratory Protection - Asbestos, #02-102 on Respiratory Protection, #02-110 Selection of Personal Protective Equipment and #02-112 on Chemical Protective Clothing

BACK SAFETY:

Back injuries can occur from either a single lift in which the lower back is over exerted or through continuous lifting in which the lower back is continuously strained up to the point of the back injury, therefore, to minimize back injuries, the following guidelines and techniques must be adhered to:

- Never attempt to lift heavy loads without help;
- The lift should be smooth and continuous, no jerking;

- Lift by bending at the knees, keeping the back in a near vertical position;
- Never twist the torso while lifting; and
- Get a firm grip on the object.

HEAT & COLD STRESS:

- The physical effects of heat & cold stress can be very hazardous. Review carefully MARCOR's Procedure #02-340 on Heat Stress and #02-341 on Cold Stress.

FIELD SAFETY HANDBOOK:

- All responsible persons should carefully review the MARCOR Employee Safety Handbook currently in use.

Procedure Number: 02-110-01

Procedure Name: Selection of Personal Protective Equipment (PPE)

Effective Date: 11-01-91

Supersedes Procedure Number: N/A

Responsible Positions: Project Manager, Health and Safety Coordinator, Operations Manager, Site Supervisor, Technician

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Objective: To set forth minimum standard operating procedures for the use and selection of Personal Protective Equipment (PPE).

This procedure should be used in conjunction with MARCOR procedures 02-102-01 Respiratory Protection and 02-112-01 Chemical Protective Clothing (CPC).

OUTLINE

I. DISCUSSION

II. LEVELS OF PROTECTION

III. PROTECTION IN UNKNOWN ENVIRONMENTS

IV. ADDITIONAL CONSIDERATIONS FOR SELECTING LEVELS OF PROTECTION

V. VAPOR OR GAS CONCENTRATIONS AS INDICATED BY DIRECT READING INSTRUMENTS

VI. DONNING AND DOFFING PPE

VII. REFERENCES

Appendix A Dermal Toxicity Data

I. DISCUSSION

Personnel must wear protective equipment when response activities involve known or suspected atmospheric contamination, when vapors, gases, or particulates may be generated by site activities, or when direct contact with skin affecting substances may occur. Full facepiece respirators protect lungs, gastrointestinal tract, and eyes against airborne toxicants. Chemical-resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals. Good personal hygiene limits or prevents ingestion of material.

Equipment to protect the body against contact with known or anticipated toxic chemicals has been divided into four categories according to the degree of protection afforded.

- Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.
- Level B: Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection.
- Level C: Should be worn when the criteria for using air purifying respirators are met.
- Level D: Should be worn only as a work uniform and not on any site with respiratory or skin hazards. It provides no protection against chemical hazards.

The Level of Protection selected should be based on:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to work being done.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgement until the hazards can be better identified.

2. Criteria for selection

Meeting any of these criteria warrants use of Level A Protection:

- The chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on:

  -- measured (or potential for) high concentration of atmospheric vapors, gases, or particulates.

  or

  -- site operations and work functions involves high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials highly toxic to the skin.

- Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.

- Operations must be conducted in confined, poorly ventilated areas until the absence of substances requiring Level A protection is determined.

- Direct readings on field Flame Ionization Detectors (FID) or Photoionization Detectors (PID) and similar instruments indicate high levels of unidentified vapors and gases in the air.

3. Guidance on Selection

a. Fully encapsulating suits are primarily designed to provide a gas or vapor tight barrier between the wearer and atmospheric contaminants. Therefore Level A is generally worn when high concentrations of airborne substances are known or thought to be present and these substances could severely effect the skin. Since Level A requires the use of a self-contained breathing apparatus, the eyes and respiratory system are also more protected.

While personal protective equipment reduces the potential for contact with toxic substances, ensuring the health and safety of responders requires, in addition, safe work practices, decontamination, site entry protocols, and other safety procedures. Together, these provide an integrated approach for reducing harm to workers.

II. LEVELS OF PROTECTION

A. Level A Protection

1. Personnel protective equipment

- Supplied air respirator approved by the Mine Safety and Health Administration (MSHA) and National Institute for Occupational Safety and Health (NIOSH). Respirators may be:

-- pressure-demand, self-contained breathing apparatus (SCBA)

or

-- pressure-demand, airline respirator (with escape bottle for Immediately Dangerous to Life and Health (IDLH) or potential for IDLH atmosphere).

- Fully encapsulating chemical-resistant suit.
- Coveralls*
- Long cotton underwear*
- Gloves (inner), chemical-resistant
- Boots, chemical-resistant, steel toe and shank. (Depending on suit construction, worn over or under suit boot)
- Hardhat* (under suit)
- Disposable gloves and boot covers* (worn over fully encapsulating suit)
- Cooling unit*
- 2 Way radio communications (inherently safe)

* Optional

Until air surveillance data is available to assist in the selection of the appropriate Level of Protection, the use of Level A may have to be based on indirect evidence of the potential for atmospheric contamination or other means of skin contact with severe skin affecting substances.

Conditions that may require Level A protection include:

- Confined spaces: Enclosed, confined, or poorly ventilated areas are conducive to the build up of toxic vapors, gases, or particulates. (Explosive or oxygen deficient atmospheres also are more probable in confined spaces). Confined space entry does not automatically warrant wearing Level A protection, but should serve as a cue to carefully considered and to justify a lower Level of Protection.

- Suspected/known highly toxic substances: Various substances that are highly toxic especially through skin absorption for example, fuming corrosives, cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens, and infectious substances may be known or suspected to be involved. Field instruments may not be available to detect or quantify air concentrations of these materials. Until these substances are identified and concentrations measured, maximum protection may be necessary.

- Visible emissions: Visible air emissions from leaking containers or railroad/vehicular tank cars, as well as smoke from chemical fires and others, indicate high potential for concentrations of substances that could be extreme respiratory or skin hazards.

- Job functions: Initial site entries are generally walk throughs in which instruments and visual observations are used to make a preliminary evaluation of the hazards. In initial site entries, Level A should be worn when:

  -- There is a probability for exposure to high concentrations of vapors, gases or particulates.

  -- Substances are known or suspected of being extremely toxic directly to the skin or by being absorbed.

- Subsequent entries are to conduct the many activities needed to reduce the environmental impact of the incident. Levels of Protection for later operations are based not only on data obtained from the initial and subsequent environmental monitoring, but also on the probability of contamination and ease of decontamination.

Examples of situations where Level A has been worn are:

- Excavating of soil to sample buried drums suspected of containing high concentrations of dioxin.

- Entering a cloud of chlorine to repair a value broken in a railroad accident.

- Handling and moving drums known to contain oleum.

- Responding to accidents involving cyanide, arsenic, and undiluted pesticides.

b. The fully encapsulating suit provides the highest degree of protection to skin, eyes and respiratory system if the suit material resists chemicals during the time the suit is worn.

While Level A provides maximum protection, all suit material may be rapidly permeated and degraded by certain chemicals from extremely high air concentrations, splashes, or immersion of boots or gloves in concentrated liquids or sludges. These limitations should be recognized when specifying the type of fully encapsulating suit. Whenever possible, the suit material should be matched with the substance it is used to protect against.

B. Level B Protection

1. Personnel protective equipment

- Supplied air respirator (MSHA/NIOSH approved). Respirators may be:

  -- pressure demand, self contained breathing apparatus

  or

  -- pressure demand, airline respirator (with escape bottle for IDLH or potential for IDLH atmosphere).

- Chemical resistant clothing (overalls and long-sleeved jacket; hooded, one or two piece chemical splash suit; disposable chemical resistant, one piece suits)

- Long cotton underwear*

- Coveralls*

- Gloves (outer), chemical resistant

- Gloves (inner), chemical resistant

- Boots (outer), chemical resistant, steel toe and shank

- Boot covers (outer), chemical resistant (disposable*)

- Hard hat (face shield*)

- 2 way radio communications* (intrinsically safe)

* Optional

2. Criteria for Selection

Meeting any one of these criteria warrants the use of Level B protection:

- The type and atmospheric concentration of toxic substances has been identified and requires a high level of respiratory protection, but less skin protection than Level A. These would be atmospheres:

  -- with concentrations Immediately Dangerous to Life and Health, (IDLH) but substance or concentration in the air does not require a severe skin hazard

  or

  -- that do not meet the selection criteria permitting the use of air purifying respirators.

- The atmosphere contains less than 19.5% oxygen.

- It is highly unlikely that the work being done will generate high concentrations of vapors, gases or particulates, or splashes of material that will affect the skin of personnel wearing Level B protection.

- Atmospheric concentrations of unidentified vapors or gases are indicated by direct readings on instruments such as the FID or PID or similar instruments, but vapors and gases are not suspected of containing high levels of chemicals toxic to skin.

3. Guidance on Selection

a. Level B does not afford the maximum skin (and eye) protection as does a fully encapsulating suit since the chemical resistant clothing is not considered gas, vapor, or particulate tight.

However, a good quality, hooded, chemical resistant, one piece garment, with taped wrist, ankles, and hood does provide a reasonable degree of protection against splashes and to lower concentrations in air. At most abandoned hazardous waste sites, ambient atmospheric gas or vapor levels have not approached concentrations sufficiently high to warrant Level A protection. In all but a few circumstances (where highly toxic materials are suspected) Level B should provide the protection needed for initial entry. Subsequent operations at a site require a re-evaluation of Level B protection based on the probability of being splashed by chemicals, their effect on the skin, the presence of hard to detect air contaminants, or the generation of highly toxic gases, vapors, or particulates, due to the work being done.

b. The chemical resistant clothing required in Level B is available in a wide variety of styles, materials, construction detail, and permeability. One or two piece garments are available with or without hoods. Disposal suits with a variety of fabrics and design characteristics are also available. Taping joints between the gloves, boots and suit, and between hood and respirator reduces the possibility for splash and vapor or gas penetration. These factors and other selection criteria all affect the degree of protection afforded. Therefore, a specialist should select the most effective chemical resistant clothing based on the known or anticipated hazards and job functions.

Level B equipment provide a high level of protection to the respiratory tract. Generally, if a self-contained breathing apparatus is required for respiratory protection, selecting chemical resistant clothing (Level B) rather than a fully encapsulating suit (Level A) is based on needing less protection against known or anticipated substances affecting the skin. Level B skin protection is selected by:

- Comparing the concentrations of known or identified substances in air with skin toxicity data.

- Determining the presence of substances that are destructive to or readily absorbed through the skin by liquid splashes, unexpected high levels of gases, vapor, or particulates, or other means of direct contact.

- Assessing the effect of the substance (at its measured air concentrations or potential for splashing) on the small areas left unprotected by chemical resistant clothing. A hooded garment taped to the mask, and boots and gloves taped to the suit further reduces area of exposure.

c. For initial site entry and reconnaissance at an open site, approaching whenever possible from upwind, Level B protection (with good quality, hooded, chemical resistant clothing) should protect response personnel, providing the conditions described in selecting Level A are known or judged to be absent.

C. Level C Protection

1. Personnel protective equipment

- Air purifying respirator, fullface canister equipped (MSHA/NIOSH approved)

- Chemical resistant clothing (coveralls; hooded, one piece or two piece chemical splash suit; chemical resistant hood and apron; disposable chemical resistant coveralls)

- Coveralls*

- Long cotton underwear*

- Gloves (outer), chemical resistant

- Gloves (inner), chemical resistant*

- Boots (outer), chemical resistant, steel toe and shank

* Optional

- Boot covers (outer), chemical resistant (disposable*)
- Hardhat (face shield*)
- Escape mask*
- 2 Way radio communications* (inherently safe)

2. Criteria for Selection

Meeting all of these criteria permits use of Level C protection:

- Oxygen concentrations are not less than 19.5% by volume.
- Measured air concentrations of identified substances will be reduced by the respirator below the substance's threshold limit value (TLV) and the concentration is within the service limit of the canister.
- Atmospheric contaminant concentrations do not exceed IDLH levels.
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any body area left unprotected by chemical resistant clothing.
- Job functions do not require self contained breathing apparatus.
- Direct readings are a few ppms above background on instruments such as the FID or PID.

3. Guidance on Selection

a. Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical resistant clothing is used. The main selection criterion for Level C is that conditions permit wearing air purifying respirators.

*Optional

The air purifying device must be a fullface respirator (MSHA/NIOSH approved) equipped with a canister suspended from the chin or on a harness. Canisters must be able to remove the substances encountered. Quarter or half masks or cheekcartridge, full face masks should be used only with the approval of a qualified individual.

In addition, a full face, air purifying mask can be used only if:

- Substance has adequate warning properties
- Individual passes a qualitative fit test for the mask
- Appropriate cartridge/canister is used, and its service limit concentration is not exceeded

b. An air surveillance program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be thoroughly monitored when personnel are wearing air purifying respirators. Periodic surveillance using direct reading instruments and air sampling is needed to detect any changes in air quality necessitating a higher level of respiratory protection.

c. Level C protection with a full face, air purifying respirator should be worn routinely in an atmosphere only after the type of air contaminant is identified, concentrations measured and the criteria for wearing air purifying respirator met. To permit flexibility in prescribing a level of protection at certain environmental incidents, a specialist could consider using air purifying respirators in unidentified vapor/gas concentrations of a few parts per million above background as indicated by a needle deflection on the FID or PID. However, a needle deflection of a few parts per million above background should not be the sole criterion for selecting Level C. Since the individual components may never be completely identified, a decision on continuous wearing of Level C must be made after assessing all safety considerations, including:

- The presence of (or potential for) organic or inorganic vapors/gases against which a canister is ineffective or has a short service life.
- The known (or suspected) presence in air of substances with low TLVs or IDLH levels.
- The presence of particulates in air.
- The errors associated with both the instruments and monitoring procedures used.
- The presence of (or potential for) substance in air which do not elicit a response on the instrument used.
- The potential for higher concentrations in the ambient atmosphere or in the air adjacent to specific site operations.

d. The continuous use of air purifying respirators (Level C) must be based on the identification of the substances contributing to the total vapor or gas concentration and the application of published criteria for the routine use of air purifying devices. Unidentified ambient concentrations of organic vapors or gases in air approaching or exceeding a few ppm above background require, as a minimum, Level B protection.

D. Level D Protection

1. Personnel Protective Equipment

- Coveralls
- Gloves*
- Boots/shoes, leather or chemical resistant, steel toe and shank
- Safety glasses or chemical splash goggles*
- Hard hat (face shield*)

*Optional

2. Criteria for Selection

Meeting any of these criteria allows use of Level D protection:

- No contaminants are present.
- Work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

Level D protection is primarily a work uniform. It can be worn only in areas where there is no possibility of contact with contamination.

III. PROTECTION IN UNKNOWN ENVIRONMENTS

In all incident response, selecting the appropriate personal protection equipment is one of the first steps in reducing health effects from toxic substances. Until the toxic hazards at an environmental incident can be identified and personnel safety measures commensurate with the hazards instituted, preliminary measures will have to be based on experience, judgement, and professional knowledge. One of the first concerns in evaluating an unknown situation is atmospheric hazards. Toxic concentrations (or potential concentrations) of vapors, gases, and particulates; low oxygen content, explosive potential and, to a lesser degree, the possibility of radiation exposure, all represent immediate atmospheric hazards. In addition to making air measurements to determine these hazards, visual observation and review of existing data can help determine the potential risks from other materials.

Once immediate hazards, other than toxic substances have been eliminated, the initial on-site survey and reconnaissance, which may consist of more than one entry, continues. Its purpose is to further characterize toxic hazards and, based on these findings, refine preliminary safety requirements. As data are obtained from the initial survey, the Level of Protection and other safety procedures are adjusted. Initial data also provide information on which to base further monitoring and sampling. No one method can determine a Level of Protection in all unknown environments. Each situation must be examined individually.

IV. ADDITIONAL CONSIDERATIONS FOR SELECTING LEVELS OF PROTECTION

Other factors which should be considered in selecting the appropriate Level of Protection are:

A. Heat and Physical Stress

The use of protective clothing and respirators increases physical stress, in particular heat stress, on the wearer. Chemical protective clothing greatly reduces body ventilation and diminishes its ability to regulate its temperature. Even in moderate ambient temperatures the diminished capacity of the body to dissipate heat can result in one or more heat related problems.

All chemical protective garments can cause heat stress. Somewhat less stress is associated with Level B or C when the protective clothing does not require the use of a hood, tightly fitted against the respirator face piece, and taped glove, boot, suit interfaces, since more body area is covered, the probability of heat stress increases. Whenever any chemical protective clothing is worn, a heat stress recovery monitoring program must occur.

Wearing protective equipment also increases the risk of accidents. It is heavy, cumbersome, decreases dexterity, agility, interferes with vision, and is fatiguing to wear. These factors all increase physical stress and the potential of accidents. In particular the necessity for selecting Level A protection, should be balanced against the increased probability of physical stress and accidents. Level B and C protection somewhat reduces accident probability, because the equipment is lighter, less cumbersome, and vision problems less serious.

B. Air Surveillance

A program must be established for routine, periodic air surveillance. Without an air surveillance program, any changes could go undetected and jeopardize response personnel. Surveillance can be accomplished with various types of air pumps and filtering devices followed by analysis of the filtering media; portable real time monitoring instruments located strategically on site; personal dosimeters; and periodic walk throughs by personnel carrying direct reading instruments.

C. Decision Logic for Selecting Protective Clothing

No adequate criteria, similar to the respiratory protective decision logic, are available for selecting protective clothing. A concentration of a known substance in the air approaching a TLV or permissible exposure limit for the skin does not automatically warrant a fully encapsulating suit. A hooded, high quality, chemical resistant suit may provide adequate protection. The selection of Level A over Level B is a judgement that should be made by a qualified individual considering the following factors:

- The physical form of the potential contaminant. Airborne substances are more likely for body contact with personnel wearing non-encapsulating suits, since they are not considered to be gas or vapor tight.

- Effect of the material on skin:

  -- highly hazardous substances are those that are easily absorbed through the skin causing systemic effects, or that cause severe skin destruction. Skin contact with liquids are generally more hazardous than vapors, gases and particulates.

  -- less hazardous substances are those that are not easily absorbed through the skin causing systemic effects, or that do not cause severe skin destruction.

- Concentration of the material - the higher the concentration, the higher the risk of harm.

- The potential for contact with the material due to work function and the probability of direct exposure to the small area of skin unprotected by Level B or C chemical resistant clothing.

D. Chemicals Toxic to Skin

The chemicals listed in Appendix III are identified in the Oil and Hazardous Materials Technical Assistance Data Base System (OHMTADS) as having adverse skin effects ranging from irritation to absorption into the body. Knowledge concerning the presence or absence of these materials could be useful in selecting the necessary Level of Protection. Other substances affecting the skin, but not listed in OHMTADS, may be present. Therefore, a major effort should be made to identify all substances.

E. Atmospheric Conditions

Atmospheric conditions such as stability, temperature, wind direction, wind velocity, and barometric pressure determine the behavior of contaminants in air or the potential for volatile material getting into air. These parameters should be considered in determining the need for and Level of Protection required.

F. Work in Exclusion Zone

For operations in the Exclusion Zone (area of potential contamination), different Levels of Protection may be selected, and various types of chemical resistant clothing worn. This selection would be based not only on measured air concentrations, but also on the job function, reason for being in the area, the potential for skin contact or inhalation of the materials present, and ability to determine the protective equipment used.

G. Escape Masks

The use of escape masks is an option in Level C protection. A specialist should determine their use on a case by case basis. Escape masks could also be strategically located on site in areas that have higher possibilities for harmful exposure.

V. Vapor or Gas Concentrations as Indicated by Direct-Reading Instruments

Instruments such as the FID and PID can be used to detect the presence of many organic vapors or gases either as single compounds or mixtures. Dial readings are frequently referred to, especially with unidentified substances, as total vapor and gas concentration (in ppm). More correctly they are deflections of the needle on the dial indicating an instrument response and does not directly relate to total concentrations in the air. As a guide to selecting Level of Protections, based on dial readings response, the following values could be used. They should not be the sole criteria for selecting Levels of Protection.

Dial Reading	Level of Protection
Background to 5 ppm above background	C
5 ppm above background to 500 ppm above background	B
500 ppm above background to 1000 ppm above background	A

Vapor or gas concentrations, as indicated by the readout on instruments such as the FIDs or PIDs are a useful adjunct to professional judgement in selecting the Level of Protection to be worn in an unknown environment. It should not be the single selection criterion, but should be considered with all other available information. Total vapor or gas concentration as selection criteria for Levels of Protection should only be used by qualified persons.

VI. DONNING AND DOFFING PPE AND SCBA

The following procedures for donning/doffing apply to certain types of suits. They should be modified if a different suit or extra boots and gloves are worn. These procedures also assume that:

- The wearer has been trained in the SCBA.
- SCBA has been checked.

- Appropriate decontamination steps have been taken prior to removal of the suit or other components.

- Sufficient air is available for routine decontamination and doffing of suit.

Donning/doffing an encapsulating suit is more difficult if the user has to do it alone because of the physical effort required. Also the possibility of wearer exposure to contaminants or damaging the suit greatly increases. Therefore, assistance is needed in donning/doffing the equipment.

A. Donning

1. Before donning suit, thoroughly inspect it for deficiencies that will decrease its effectiveness as the primary barrier for protecting the body. Do not use any suit with holes, rips, malfunctioning closures, cracked masks, etc. If suit contains a hoodpiece, or a hard hat is worn, adjust it to fit user's head. If the suit has a back enclosure for changing air bottles, open it.

2. Use a moderate amount of talcum powder or cornstarch to prevent chafing and increase comfort. Both powder and cornstarch also reduce rubber binding.

3. Use antifog on suit and mask facepieces.

4. While sitting (preferably), step into legs, place feet properly, and gather suit around waist.

5. While sitting (preferably), put on chemical resistant, steel toe and shank boots over feet of suit. Properly attach and affix suit leg over top of boot.

   - For one piece suits with heavy soled protective feet, wear leather or short rubber safety boots inside suit.

   - Wear an additional pair of disposable boot protectors if necessary.

6. Put on SCBA airtank and harness assembly. Don facepiece and adjust it securely yet comfortably. Do not connect breathing hose. Open valve to air tank. (The air tank and harness assembly could also be put on before stepping into legs of suit).

7. Depending on type of suit:

   - Put on inner gloves

   - For suits with detachable gloves, secure gloves to sleeves, if this has not been done prior to entering the suit. (In some cases, extra gloves are worn over suit gloves).

8. While standing, put arms into sleeves, and then head into hood of suit. The helper pulls suit up and over SCBA, resting hood on top of SCBA, adjusting suit around SCBA backpack and user's shoulders to assure unrestricted motion. To facilitate entry into the suit, bend at the knees as hood is placed over wearer's head. Avoid bending at the waist, as this motion tends to use up room in the suit rather than provide slack. For a tall or stout person, it is easier to put on the hood of the suit before getting into the sleeves.

9. Begin to secure suit by closing all fasteners until there is only room to connect the breathing hose. Also, secure all belts and/or adjustable leg, head, and waist bands. Connect breathing hose while opening main valve.

10. When breathing properly in SCBA, complete closing suit.

11. Helper should observe for a time to assure that wearer is comfortable and equipment is functioning properly.

B. Doffing

Exact procedures must be established and followed to remove the fully encapsulating suit and SCBA. Adherence to these procedures is necessary to minimize or prevent contamination (or possible contamination) of the wearer through contacting the outside surface of the suit.

The following procedures assume that before the suit is removed, it has been properly decontaminated, considering the type and extent of contamination, and that a suitably attired helper is available.

1. Remove any extraneous or disposable clothing, boot covers, or gloves.

2. If possible, wearer kicks off chemical resistant boots unassisted. To achieve this, oversized boots are often selected. Otherwise, helper loosens and removes chemical resistant boots.

3. Helper opens front of suit to allow access to SCBA regulator. As long as there is sufficient air pressure, hose is not disconnected.

4. Helper lifts hood of the suit over wearer's head and rests hood on top of SCBA air tank. For a tall or stout person it is easier to remove the arms from the sleeves of the suit prior to removing the hood.

5. Remove external gloves.

6. To minimize contact with contaminated clothing, helper touches only the outside of the suit, and the wearer touches only the inside. Remove arms, one at a time, from suit. Helper lifts suit up and away from SCBA backpack, avoiding any contact between outside surface of suit and wearer's body. Helper lays suit out flat behind wearer.

7. While sitting (preferably), remove both legs from suit.

8. After suit is completely removed, roll internal gloves off hands, inside out.

9. Walk to clean area and follow procedure for doffing SCBA.

10. Remove inner clothing, clean body thoroughly.

C. Additional Considerations for Donning/Doffing

1. If work is at a very dirty site or the potential for contamination is extremely high, wear disposable Tyvek or PVC coveralls over fully encapsulating suit. Make a slit in back to fit around bulge of the SCBA backpack.

2. Wear clothing inside the suit appropriate to outside temperatures. Even in hot weather, wear long cotton underwear, which absorbs perspiration and acts as a wick for evaporation, thus aiding body cooling. Long underwear also protects skin from contact with hot surface of suit, reducing the possibility of burns in hot weather.

3. Monitor wearer for heat stress.

4. If a cooling device is used, modify donning/doffing procedure.

5. If low pressure warning alarm sounds signifying approximately 5 minutes of air remaining, follow these procedures.

   - Quickly hose off suit and scrub especially around entrance/exit zipper. (Remove any disposable clothing).

   - Open zipper sufficiently to allow access to regulator and breathing hose.

   - Disconnect breathing hose from regulator as main valve is closed.

   - Immediately attach canister for vapor, acid, gas, dust, mist, or fume to breathing hose. This provides protection against contaminants still present.

   - Continue doffing suit as already discussed. Take extra care to avoid contaminating helper and wearer.

VII. REFERENCES

Handbook of Hazardous Waste Regulation Vol. II: How to Protect Employees During Environmental Incident Response; Official EPA Health and Safety Guidance U.S. EPA November, 1984.

APPENDIX A

DERMAL TOXICITY DATA

I. SELECTION OF CHEMICALS

The approximately 350 chemicals listed in Table III-1, at the end of this appendix, are identified in the Oil and Hazardous Materials Technical Assistance System (OHMTADS) as being dermally active. Since OHMTADS contains only about 1200 chemicals, or may not indicate a listed chemical as a skin hazard, other reference sources should also be consulted.

The data in Table III-1 were compiled by a toxicologist through a special project with the U.S. Environmental Protection Agency. As with any source of information, the data should be cross-checked against other standard references.

II. USE OF TABLES

A. Categories

Table III-1 divides chemicals into two categories:

Category 1 (more serious), which includes:

- Gases having a systemic dermal toxicity rating of moderate to extremely hazardous and a skin penetration ranking of moderate to high.
- Liquids and solids having a systemic dermal toxicity rating of extremely hazardous and a skin penetration ranking of moderate to high.
- Gases having a local dermal toxicity rating of moderate to extremely hazardous.
- Liquids and solids having a local dermal toxicity rating of extremely hazardous.

Category 2 (less serious), which includes:

- Gases having a systemic dermal toxicity rating of slightly hazardous and a skin penetration ranking of slight.
- Liquids and solids having a systemic dermal toxicity rating of slightly hazardous and a skin penetration ranking of moderate to slight.
- Gases having a local dermal toxicity rating of slightly hazardous.

- Liquids and solids having a local dermal toxicity rating of moderate to slightly hazardous.

B. Physical State

The physical state of the chemicals listed is their normal state. In a fire, some listed as solids or liquids could vaporize and represent a greater hazard to the skin. The chemicals listed may also be found mixed with other substances, which could change how they affect the skin.

C. Skin Penetration

- Negligible Penetration (solid - polar)

+ Slight Penetration (solid - nonpolar)

++ Moderate Penetration (liquid/solid - nonpolar)

+++ High Penetration (gas/liquid - nonpolar)

D. Potency (Systemic)

		Lethal amount to a 70-kilogram man
+++	Extreme Hazard (LD_{50}: 1 mg/kg-50 mg/kg)	drops to 20 ml
++	Moderate Hazard (LD_{50}: 50-500 mg/kg)	1 ounce - 1 pint (1 pound)
+	Slight Hazard (LD_{50}: 500-15,000 mg/kg)	1 pint - 1 quart (2.2 pounds)

E. Potency (Local)

+++ Extreme - Tissue destruction/necrosis

++ Moderate - Irritation/inflammation of skin

+ Slight - Reddening of skin

III. RELATION OF TABLE III-1 AND LEVELS OF PROTECTION

The purpose of Table III-1 is to provide data that a qualified person can use in conjunction with other site specific knowledge to select protective clothing. The data relate to skin toxicity only and should not be used to select respiratory protection equipment.

The known or suspected presence and/or measured concentration of Category 1 chemicals at or above the listed concentrations warrants wearing a fully encapsulating suit (Level A). The known or suspected presence and/or measured concentration of Category 2 chemicals at or above the listed concentrations suggests that a lesser level of skin protection (Level B or C) is needed.

IV. OTHER REFERENCES

Table III-1 does not include all substances affecting the skin. Other standard references should be consulted, in particular.

- Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment With Intended Charges for 1982, American Conference of Governmental Industrial Hygienists, 6500 Glenway Ave., Building D-5, Cincinnati, OH 45211 (1982).

- NIOSH/OSHA Pocket Guide to Chemical Hazards, U.S. Government Printing Office, Washington, DC 20402 (August 1981).

- Registry of Toxic Effects of Chemical Substances, U.S. Government Printing Office, Washington, DC 20402 (1980).

When possible, data in one reference should be cross-checked with other references.

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
2,2 Dichloropropionic acid	solid	+	local	++	-	2
2,4,5 - T Acid	solid	+	systemic local	+ ++	10 mg/m^3/8h	2
2,4,5 - T Amines	solid	+	systemic local	+ ++	10 mg/m^3/8h	2
2,4,5 - T Esters	solid	+	systemic local	+ +	10 mg/m^3/8h	2
2,4,5 - TP Acid	solid	+	systemic local	+ ++	10 mg/m^3/8h	2
2,4,5 - TP Acid Esters	liquid	++	systemic local	+ +	10 mg/m^3/8h	2
2,4,5 - T Salts	solid	+	systemic local	+ +	10 mg/m^3/8h	2
2,4 - D Acid	solid	+	systemic local	+ ++	10 mg/m^3/8h	2
2,4 - Dichlorophenol	solid	+	systemic local	+ ++	-	2
2,4 - D - Esters	liquid	++	systemic local	+ +	10 mg/m^3/8h	2
2 - Ethylhexyl Acrylate	liquid	++	local	+++	-	2
2 - Methyl - 5 - ethyl pyridine	liquid	++	local	+	-	2

TABL (CONTINUED)

DERMAL TOXICITY

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Arsenic Trioxide	solid	++	local systemic	+++ +++	.25 mg/m^3/8h	1
Arsenic Trisulfide	solid	++	local systemic	+++ +++	0.5 mg/m^3/8h	1
Barium	solid	+	local	++	0.5 mg/m^3/8h	2
Benzene	liquid	++	local systemic	++ +++	75 ppm/30 min	1
Benzophenone	solid	+	local	++	-	2
Benzoyl Chloride	liquid	++	local	+++	5 mg/m^3/8h	1
Benzoyl Peroxide	solid	++	local	+++	5 mg/m^3/8h	1
Benzyl Alcohol	liquid	++	local systemic	++ +	-	2
Benzyl Benzoate	liquid	++	local	++	-	2
Benzyl Bromide	liquid	++	local	++	-	2
Benzyl Chloride	liquid	++	local	+++	1 ppm/8h	2
Beryllium Nitrate	solid	+	local	++	0.25 mg/m^3/8h	2

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Chloracetophenone	solid	+	local systemic	++ ++	.05 ppm/8h	2
Chlordane	solid	+	local systemic	++ ++	.5 mg/m^3/8h	2
Bromine	liquid (fuming)	++	local systemic	+++ ++	.1 ppm/8h	1
Butylamine	liquid	++	local	+++	5 ppm/8h	1
Butyl Mercaptan	liquid	++	local	++	.5 ppm/8h	2
Butyric Acid	liquid	++	local	++	-	2
Calcium Arsenate	solid	+	local systemic	++ +++	1 mg/m^3/8h	1
Calcium Arsenite	solid	+	local systemic	++ +++	-	1
Calcium Carbide	solid	+	local	++	-	2
Calcium Cyanide	solid	++	systemic local	+++ ++	5 mg/m^3/10 min	1
Chlorine	gas	+++	local	+++	1 ppm/8h 3 mg/m^3/8h	1
Chlorine - 36 (radioactive)	gas	+++	local	+++	-	1

TABLE [illegible] (CONTINUED)

DERMAL TOXICITY

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Crotonaldehyde	liquid	++	local systemic	++ ++	2 ppm/8h	2
Cumene	liquid	++	local systemic	++ +	50 ppm/8h	2
Cupric Acetate	solid	+	local systemic	+++ ++	0.1 mg/m^3/8h	2
Cupric Acetoarsenate	solid	+	local systemic	++ ++	0.1 mg/m^3/8h	2
Cupric Sulfate, Ammoniated	solid	+	local	++	2 mg/m^3/8h	2
Cyanogen	gas	+++	systemic local	+++ ++	10 ppm/8h	1
Cyanogen Bromide	solid	++	local systemic	+++ ++	0.5 ppm/8h	1
Cyanogen Chloride	gas	+++	local systemic	++ ++	10 ppm/15 min 5 mg/m^3/8h	1
Cyclohexanol	liquid	+	local systemic	++ +	50 ppm/8h	2
Cyclohexanone	liquid	+	local systemic	++ +	50 ppm/8h	2
Cyclohexylamine	liquid	++	local systemic	++ ++	10 ppm/8h	2
Decaborane	solid	+	local systemic	++ ++	.05 ppm/8h	2

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Dichloropropene Dichloropropane	liquid	++	local systemic	++ ++	-	2
Dichlorvos	liquid	++	systemic	++	.1 ppm/8h 1 mg/m^3/8h	2
Dicyclopentadiene	liquid	++	local	+++	5 ppm/8h	2
Diethanolamine	solid	+	local	++	-	2
Diethylamine	liquid	++	local	++	25 ppm/8h	2
Diethylene Glycol	liquid	+	systemic	+	-	2
Diethylenetriamine	liquid	+	local	+++	1 ppm/8h	2
Diethyl Phthalate; Ethyl Formate	liquid	++	local	+	-	2
Dimethylamine	oily liquid	++	local	+++	10 ppm/8h 18 mg/m^3/8h	2
N,N - dimethylaniline	oily liquid	+++	systemic local	++ +	5 ppm/8h 25 mg/m^3/8h	2
Dimethylsulfate	liquid	++	local	+++	1 ppm/8h	2
Dioxane (p-dioxane)	liquid	++	local systemic	++ +	50 ppm/8h	2

TABLE 1-1 (CONTINUED)

DERMAL TOXICITY

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Ethyl Acrylate	liquid	++	local systemic	++ ++	25 ppm/8h 100 mg/m^3/8h	2
Ethyl Benzene	liquid	++	local systemic	++ ++	100 ppm/8h	2
Ethyl Chloride	liquid	++	local frostbite	++	1,000 ppm/8h	2
Ethylene	gas	++	local frostbite	++	-	2
Ethylene Cyanohydrin	liquid	++	systemic	+	-	2
Ethylene Dibromide	liquid	++	local systemic	++ ++	20 ppm/8h 50 ppm/5 min	2
Ethylene Dichloride	liquid	++	local systemic	++ ++	10 ppm/8h 200 ppm/5 min	2
Ethylene Glycol Diacetate	liquid	++	systemic	+	-	2
Ethylene Glycol Monoethyl Ether Acetate	liquid	++	systemic local	+ +	100 ppm/8h	2
Ethylene Glycol Monoethyl Ether	liquid	++	systemic	+	25 ppm/8h	2
Ethylene Oxide	liquid	+	local	+++	50 ppm/8h	2
Ethyl Ether	liquid	+	local	+++	400 ppm/8h	2

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Gas oils	liquid	++	local	+	-	2
Glyoxal	liquid	+	local	+	-	2
Guthion	solid	++	systemic	++	-	2
Heptachlor	solid	+++	systemic local	++ +	.5 mg/m^3/8h	2
Heptane	liquid	++	local systemic	+ ++	500 ppm/8h	2
Heptanol	liquid	++	local systemic	+ ++	-	2
HETP	liquid	+++	systemic	+++	-	1
Hexaborane	liquid	++	local systemic	++ ++	-	2
Hexamethylenediamine	solid	++	local systemic	+++ ++	-	2
Hexane	liquid	++	local systemic	+ ++	500 ppm/8h	2
Hexanol	liquid	++	local	+++ ++	-	2
Hexylene Glycol	liquid	++	local systemic	++ +	25 ppm/8h 125 mg/m^3/8h	2

TABLE 1 (CONTINUED)

DERMAL TOXICITY

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Isobutyraldehyde	liquid	++	local systemic	+++ +	-	2
Isobutyric Acid	liquid	+	local systemic	+++ +	-	2
Isophorone	liquid	++	local systemic	++ ++	25 ppm/8h	2
Isophthaloyl Chloride	solid	+	local systemic	++ +	-	2
Isopropyl Acetate	liquid	++	local systemic	+ +	250 ppm/8h	2
Isopropylamine	liquid	++	local systemic	++ ++	5 ppm/8h	2
Isopropyl Ether	liquid	++	local systemic	++ +	250 ppm/8h	2
Kepone	liquid	++	local systemic	+ ++	-	2
Krypton 85 (radioactive)	gas	+++	systemic	+++	-	1
Lead Arsenate	solid	+	local systemic	+ ++	.5 mg/m^3/8h	2
Lead Fluoborate	solid	+	local systemic	++ ++	-	2
Lindane	solid	++	systemic	++	.5 mg/m^3/8h	2

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Methyl Ethyl Ketone	liquid	++	local systemic	+ ++	590 mg/m^3/8h	2
Methyl Isobutyl Ketone	liquid	++	local systemic	+ +	100 ppm/8h	2
Methyl Mercaptan	gas	+++	local systemic	++ ++	10 ppm/8h	2
Methyl Methacrylate	liquid	++	local	+++	100 ppm/8h	2
Methyl Parathion	liquid	+++	systemic	+++	200 ug/m^3	1
Mexacarbate	solid	++	local systemic	+ +++	-	2
Monochloroacetone	liquid	++	local systemic	++ ++	-	2
Monochlorodifluoromethane	liquid	++	local (frostbite) systemic	+++ ++	1,000 ppm/8h	2
Monoethylamine	gas	+++	local	+++	10 ppm/8h	1
Monoisopropanolamine	liquid	++	local	++	-	2
Monomethylamine	gas	+++	local	+++	10 ppm/8h	1
Morpholine	liquid	++	local systemic	++ ++	20 ppm/8h	2

TABLE III-1 (CONTINUED)

DERMAL TOXICITY

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Nickel Ammonium Sulfate	solid	+	local	++	1 mg/m^3/8h	2
Nickel Carbonyl	liquid	++	local systemic	++ ++	.05 ppm/8h	2
Nitric Acid	liquid	+	local	+++	2 ppm/8h	1
Nitric Oxide	gas	++	local	+++	25 ppm/8h	1
Nitrilotriacetic Acid	solid	+	local	++	-	2
Nitrogen Dioxide	gas	++	local	++	5 ppm/15 min	1
Nitrobenzene	liquid	++	local systemic	++ ++	1 ppm/8h 5 mg/m^3/8h	2
Nitrogen Chloride	liquid	++	local	++	-	2
Nitroglycerine	liquid	++	local systemic	++ ++	2 mg/m^3/8h	2
Ozone	gas	+	local systemic	++ ++	.1 ppm/8h	2
Nitrous Oxide	gas	++	local	+++	25 ppm/8h	2
Nonane	liquid	++	local	++	-	2

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Phosgene	gas	+	local	+++	.1 ppm/8h	1
White Phosphorous (yellow)	solid	+	local systemic	+++ ++	-	1
Phosphorous Oxychloride	liquid	++	local systemic	+++ ++	-	2
Phosphorous Pentasulfide	solid	+	local systemic	+++ ++	1 mg/m^3/8h	2
Phosphorous Trichloride	liquid	++	local systemic	+++ ++	.5 ppm/8h 3 mg/m^3/8h	2
Phthalic-Acid-Diethyl-Ester	liquid	++	local	+	-	2
Phthalic Anhydride	solid	+	local systemic	++ +	1 ppm/8h	2
p-nitrophenol	solid	+	local systemic	++ ++	-	2
Potassium Arsenate	solid	+	local systemic	++ +++	.5 mg/m^3/8h	2
Potassium Arsenite	solid	+	local systemic	++ +++	-	2
Potassium Permanganate	solid	+	local	+++	-	2
Propane	gas	++	local frostbite	+++	1,000 ppm/8h	2

TABLE -1 (CONTINUED)

DERMAL TOXICITY

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Pyridine	liquid	++	local systemic	++ +	5 ppm/8h	2
Pyrocatechol	solid	+	local systemic	++ +	1 ppm/8h	2
Quinhydrone	solid	+	local systemic	++ +	-	2
Quinine	solid	+	local systemic	+ +	-	2
Quinolene	liquid	++	local systemic	++ ++	-	2
Quinone	solid	+	local systemic	++ ++	.1 ppm/8h	2
Resorcinol	solid	+	local systemic	+++ ++	10 ppm/8h	2
Salicyaldehyde	liquid	++	local systemic	++ +	-	2
sec-Butylamine	liquid	+	local systemic	+++ ++	15 mg/m^3/8h	2
Selenium	solid	+	local systemic	++ ++	-	2
Selenium 75 (Radioactive)	solid	+	local systemic	++ +++	-	2
Sesone	solid	+	local systemic	++	-	2

DERMAL TOXICITY

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Sodium Hypochlorite	liquid	++	local	+++	-	2
Sodium Lauryl Sulfate	solid	+	local	++	-	2
Sodium Methylate	solid	+	local	++	-	2
Sodium Naphthalene Sulfate		+	local systemic	+ ++	-	2
Sodium Nitrite	solid	+	local systemic	++ ++	-	2
Sodium Octylsulfate	solid	+	local	+	-	2
Sodium Selenite	solid	+	local systemic	++ ++	.2 mg/m^3/8h	2
Strychnine	solid	+	local systemic	++ +++	.15 mg/m^3/8h .45 mg/m^3/15 min	2
Styrene	liquid	++	local systemic	++ ++	100 ppm/8h 125 ppm/8h	2 2
Sulfoxide	solid	+	local	+	-	2
Sulfur	solid	+	local	++	-	2
Sulfur Dioxide	gas	+++	local	+++	5 ppm/8h	1

TAB 1 (CONTINUED)

DERMAL TOXICITY

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Thallous Nitrate	solid	+	systemic	+++	0.1 mg/m^3/8h	2
Thiophosgene	liquid	+	local	+++	-	2
Thiram	solid	++	local systemic	++ ++	5 mg/m^3/8h	2
Titanium 44	solid	+	local	+	-	2
Titanium Chloride	solid	+	local	++	-	2
Toluene	liquid	+	local systemic	+ +	100 ppm/8h 375 mg/m^3/8h	2
Toluene diisocyanate	liquid	+	local systemic	++ ++	.02 ppm/8h .14 mg/m^3/8h	2
Toxaphene	solid	++	local systemic	+ ++	.5 mg/m^3/8h	2
Trichlorfon	solid	++	systemic	++	-	2
Trichloroethane	liquid	++	local systemic	++ ++	10 ppm/8h 45 mg/m^3/8h	2
Tricresyl Phosphate	liquid	++	local systemic	+ ++	-	2
Triethylaluminum	liquid	+	local	+++	-	1

Chemical	Physical State	Skin Penetration	Dermal Toxicity	Potency	Permissible Concentration	Category
Xenon 133 (radioactive)	gas	+++	systemic	+++	-	1
Zinc Borate	solid	+	local	++	10 mg/m^3/8h	2
Zinc Chloride	solid	+	local	++	1 ppm/8h	2
Zinc Cyanide	solid	+	local systemic	+ +++	-	1
Zinc Hydrosulfite	solid	+	local	+++	-	2
Zinc Phenolsulfonate	solid	+	local	+++	-	2
Zinc Phosphide	solid	+	local systemic	++ ++	-	2

- Stationary machinery and equipment shall be placed on a firm foundation and secured before being operated.

- All points requiring lubrication during operation shall have fittings so located or guarded to be accessible without hazardous exposure.

- When necessary, all mobile equipment and the area in which they are operated shall be adequately illuminated while work is in progress.

- All vehicles which will be parked or moving slower than normal traffic on haul roads at night shall have a yellow flashing light or four-way flashers visible from all directions.

- Mobile type equipment, operating within an off-highway job site not open to public traffic, shall have a service brake system and a parking brake system capable of stopping and holding the equipment fully loaded on the grade of operation. Braking systems shall be in accordance with the following SAE recommended practices:

- Minimum performance criteria for brake systems for crawler tractors and crawler loaders.

- Brake test procedure and brake performance criteria for agricultural equipment.

- Minimum performance criteria for brake systems for self-propelled, smooth steel wheel, pneumatic tired or multiple projection steel wheel rollers and compactors.

- Minimum performance criteria for braking systems for rubber-tired skidders.

- Braking performance - off-highway dumpers.

- Certain heavy duty haulage equipment shall, in addition to complying with 18.A.21., have an emergency brake system. The emergency brake system shall automatically stop the equipment upon failure in the service brake system. The system shall also be manually operable from the driver's position. Emergency brake systems for off-highway equipment shall comply with

industry and SAE recommended practices. On highway or on/off highway equipment shall meet applicable SAE and DOT requirements.

- No one shall be permitted in the truck cab during loading operations except the driver and then only if the truck has a cab protector.
- Fill hatches on water haul vehicles shall be secured or the opening reduced to a maximum 8 inches.
- Mechanized equipment shall be shut down prior to and during fueling operations. Closed systems, with automatic shut-off which will prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.
- All towing devices used on any combinations of equipment shall be structurally adequate for the weight drawn and securely mounted.
- Persons shall not be permitted to get between a towed and towing piece of equipment until the towing equipment has been stopped.
- All equipment with windshields shall be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields shall be equipped with operable defogging or defrosting devices.
- All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, shall have lights or reflectors, or barricades equipped with lights or reflectors, to identify the location of the equipment.
- Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked or track mechanism blocked and the parking brake set.
- Lift trucks, stackers, etc., shall have the rated capacity posted on the vehicle so as to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also shall be clearly shown on the vehicle. The ratings shall not be exceeded.

- No modifications or additions which affect the capacity or safe operation of equipment shall be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

- Steering or spinner knobs shall not be attached to the steering wheel unless the steering mechanism prevents road reactions from causing the steering handwheel to spin. When permitted the steering knob shall be mounted within the periphery of the wheel.

- All industrial trucks in use shall meet the requirements of design, construction, stability, inspection, testing, maintenance, and operation.

- The installation of live booms on material and personnel hoists is prohibited.

- Safeguards shall be provided to prevent equipment such as rubber-tired bulldozers, front-end loaders, and land cranes operating on floating plant from going into the water.

- The controls of loaders, excavators, or similar equipment with folding booms or lift arms shall not be operated from a ground position unless so designed.

- Personnel shall not work or pass under the buckets or booms of loaders in operation.

- Tire service vehicles shall be operated so that the operator will be clear of tires and rims when hoisting operations are being performed. Tires large enough to require hoisting equipment will be secured from movement by continued support of the hoisting equipment unless bolted to the vehicle hub or otherwise restrained.

- Each bulldozer, scraper, dragline, crane, motor grader, front-end loader, mechanical shovel, backhoe, and other similar equipment shall be equipped with at least one dry chemical or carbon-dioxide fire extinguisher, having a minimum UL rating of 5-B:C.

Guarding and Safety Devices

- All self-propelled construction equipment, except light service trucks, panels, pickups, station wagons, crawler cranes, power shovels, and draglines, whether moving alone or in combination, shall be equipped with a reverse signal alarm. Alarm shall be audible and sufficiently distinct to be heard under prevailing condition. Alarm shall operate automatically upon commencement of backward motion. Alarm may be continuous or intermittent (not to exceed 3-second intervals) and shall operate during the entire backward movement. Electrical alarms shall meet SAE J 994b. Equipment designed and operated so that the operator is always facing the direction of motion does not require reverse signal alarms.

- The reverse signal alarms shall be in addition to requirements for signalpersons.

- All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded when exposed to contact by persons or otherwise create a hazard. Guarding shall meet the requirements of ANSI, Safety Standards for Mechanical Power Transmission Apparatus.

- All hot surfaces of equipment, including exhaust pipes or other lines, shall be guarded or insulated to prevent injury and fire.

- Fuel tanks shall be located in a manner which will not allow spills or overflows to run onto engine, exhaust, or electrical equipment.

- Exhaust or discharges from equipment shall be so directed that they do not endanger persons or obstruct view of operator.

- All equipment having a charging skip shall be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.

- Platforms, footwalks, steps, handholds, guardrails, and toeboards shall be provided on machinery and equipment to provide safe footing and accessways.

- Equipment shall be provided with suitable working platforms, guard rails, and hand grabs when attendants or other employees

are required to ride for operating purposes outside the operator's cab or compartment. Platforms and steps shall be of nonskid material.

- Hand operated power equipment such as power mowers, flails, floor finishers, power screeds, and grinders shall have guards that contact the operator's foot before the operating head or blade.

- Substantial overhead protection shall be provided for the operators of fork lifts and similar material handling equipment.

- A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

- No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective except for making immediate repairs, lubrications, or adjustments, and then, only after the power has been shut off.

- All guards and devices shall be replaced immediately after completion of repairs and adjustments and before power is turned on.

- A warning device or signalperson shall be provided where there is danger to persons from moving equipment, swinging loads, buckets, booms, etc.

- Seatbelts and anchorages meeting the requirements of 49 CFR 571 (Department of Transportation Federal Motor Vehicle Safety Standards) shall be installed and worn in all motor vehicles. Two piece seat belts and anchorages for construction equipment shall comply with applicable Federal specifications or SAE J 386a and shall be worn.

- All high rider industrial trucks shall be equipped with overhead guards which meet the structural requirements defined in paragraph 4.21 of American National Standards Institute B56.1, Safety Standards for Powered Industrial Trucks.

- Suitable protection against the elements, falling of flying objects, swinging loads, and similar hazards shall be provided for operators of all machinery or equipment. Glass used in

windshields or cabs shall be safety glass. Broken or cracked glass shall be replaced as soon as possible.

- All bulldozers, tractors, or similar equipment used in clearing operations shall be provided with substantial guards shields, canopies, and grills to protect the operator from falling and flying objects as appropriate to the nature of the clearing operations. The overhead covering on this canopy structure shall be of not less than 1/8 inch steel plate or 1/4 inch woven wire mesh with openings no greater than 1 inch, or equivalent.

  The opening in the rear of the canopy structure shall be covered with not less than 1/4 inch woven wire mesh with openings no greater than 1 inch.

- Rollover Protective Structures (ROPS) and Falling Object Protective Structures (FOPS):

a. In addition to the requirements, seat belts and rollover protective structures (ROPS) shall be installed on crawler and rubber-tire tractors such as dozers, push and pull tractors, winch tractors, and mowers (except side boom pipe-laying equipment); off-the-highway self-propelled pneumatic-tire earth movers such as trucks, pans, scrapers, bottom dumps and end dumps; motor graders; water tank trucks having a tank height less than the cab; and other self-propelled construction equipment such as front-end loaders, backhoes, rollers, and compactors. ROPS are not required on trucks designed for hauling on public highways, crane-mounted dragline backhoes, tractors or front-end loaders only when used to unload material from barges, sections of rollers and compactors of the tandem steel-wheeled and self-propelled pneumatic tired type that do NOT have an operators station, self-propelled rubber-tired lawn an garden tractors under 20 drawbar horsepower, cranes, draglines, or equipment on which the operator's cab and boom rotate as a unit. Note: ROPS may be removed from certain types of equipment when the work cannot be performed with the ROPS in place and when ROPS removal is approved in writing by the Operations Manager.

b. ROPS shall be installed in accordance with the manufacturer's or designer's recommendations. The operating authority shall furnish certification from the manufacturer or a Registered Professional Engineer that the ROPS complies with the applicable standards listed in paragraphs c,d,e and f below. The following information permanently affixed to the ROPS is acceptable in lieu of a written certification.

(1) Manufacturers or fabricator's name and address;
(2) ROPS model number, if any;
(3) Machine make, model, or series number that the structure is designed to fit.

c. ROPS for construction and grounds keeping equipment will comply with the following applicable SAE recommended practices:

J 1084a. Operator Protective Structure Performance Criteria for certain Forestry Equipment.

J 167a. Overhead Protection for Agricultural tractors-Test Procedures and Performance Requirements.

J 1194. Roll-over Protective Structures (ROPS) for Wheeled Agricultural Tractors.

J 1040c. Performance Criteria for Rollover Protective Structures (ROPS) for Construction, Earthmoving, Forestry, and Mining Machines.

d. ROPS certified to meet SAE standards superceded by this standard are acceptable. ROPS shall also be acceptable if they meet the criteria of any state which has a DOL approved OSHA program or meet Water and Power Resources Service Requirements.

e. FOPS for construction and grounds keeping equipment will be furnished when applicable and comply with the following applicable SAE recommended practices:

J 231. Minimum Performance Criteria for Falling Object Protective Structures (FOPS).

J 1043. Minimum Performance Criteria for Falling Object Protective Structure (FOPS) for Industrial Equipment.

f. Field welding on ROPS shall be performed by welders who are certified by the contractor as being qualified in accordance with American Welding Society Standards D1.1, Military Standard MIL-STD 248; or equivalent.

- Accessible areas within the swing radius of the rear of the rotating super-structure of a crane, either permanently or temporarily mounted, shall be barricaded to prevent an employee from being struck or crushed by the crane.

Hoisting Equipment General

- All hoisting equipment must be capable of satisfactorily completing a performance (operating) test before being placed in service on a project. This test shall consist of maneuvering a specified test load through maximum lift height, lift radius, and boom quadrant. Except for the test load, the anticipated load is the maximum load that can be lifted by the hoisting equipment. Test shall be repeated prior to unusual or critical lifts, and after alteration, modifications, repairs or reassembly, and at least every 12 months. Test records shall be made a part of the official project file. The above test requirements do not apply to permanently installed cranes in powerhouses, pumping stations, boatyards, hopper dredges, locks, and dams. Such permanently installed equipment will be tested in accordance with the policy established by the designated authority. A thorough annual inspection of the hoisting machinery shall be made by a competent person.

- Load capacities, determined by the performance test, recommended operating speeds, and special hazard warnings or instructions shall be posted where clearly visible to the operators of cranes and derricks and posted on hoist and elevator cars and platforms.

- At no time shall a crane be loaded in excess of the manufacturer's rating except during performance tests. test loads shall not exceed that specified by the ANSI B30 series requirements for a particular crane type.

- No modifications or additions which affect the capacity or safe operation of the equipment shall be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

- All load drums on load-hoisting equipment shall be equipped with at least one positive holding device. This device should be applied directly to the motor shaft or some part of the train gear.

- Braking equipment capable of stopping, lowering, and holding a load of at least the full test load shall be provided.

- There shall be at least two full wraps of cable on the drums of hoisting equipment at all times.
- Riding on loads, hooks, hammers, buckets, material hoists, or other hoisting equipment not meant for personnel handling is prohibited.
- While hoisting equipment is in operation, the operator shall not perform any other work and he/she shall not leave his/her position at the controls until the load has been safely landed or returned to ground level.
- A standard signal system shall be used on all hoisting equipment (APP B).
- Whenever a slack line condition occurs, prior to further operations, the proper seating of the rope in the sheaves and on the drum shall be checked.
- Crane booms shall be lowered to ground level or secured against displacement by wind loads or other outside forces when not in use.
- Except as modified by this manual, the manufacturer's specifications and limitations applicable to the operation of any and all cranes, derricks, hoists and elevators shall be followed. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be documented and recorded. Attachments used with cranes shall not exceed the capacity rating, or scope recommended by the manufacturer.
- All windows in crane cabs shall be of distortion free safety glass, or equivalent, that will not interfere with the safe operation of the machine.
- The hoist rope shall not be wrapped around the load.
- Hoisting ropes shall be installed in accordance with the wire rope manufacturer's recommendations.
- Adequate clearance shall be maintained between moving and rotating structures of the crane and fixed objects to allow the passage of employees without harm.

- All mobile cranes with cable-supported booms (except draglines) shall be equipped with boom stops to resist the boom falling backwards. At the angle specified by the crane manufacturer, the boom stop shall limit the movement of that portion of the boom below the point at which the boom stop acts on the boom. The boom stops shall provide energy withstanding resistance to the backward movement of the boom through an angular movement of approximately the last 5 degrees (over travel) about the boom foot pin.

- The boom stop manufacturer shall certify that the boom stop has been designed, functionally tested and manufactured such that it will fulfill the requirements of SEA J 220, Crane Boom Stops (May 1971). (Pre 1971 cranes will essentially meet the requirements of SAE J 220 except the paragraph 4.1.). Also, a crane/boom stop field test will be conducted. To verify the proper setup of the boom stops and functioning of the boom hoist disengaging device. This test will be conducted prior to initiating the load performance test required by EM 385-1-1 sections 2.C.01 and 2.D.01. Deficiencies noted should be corrected prior to the load performance test. Test procedures are in Appendix AA.

- By 1 July 1988 all cranes with cable supported booms (except draglines) shall be equipped with a properly functioning boom hoist disengaging device which shall automatically and completely disengage the boom hoisting power from the boom hoist drum when the boom has reached its highest rated angle. When power is thus disengaged, the boom hoist drum shall automatically be restrained from motion in the lowering direction under any rated condition.

- All cranes will at all times have a current set of operator manual(s) (instructions) for the particular model/type/class crane. Operator manual(s) must be located in the crane cab prior to testing and must remain there. When operator manual(s) are not in the language of the operator, basic operating instructions must accompany the manual and be presented in a manner (language and/or diagrams, pictures, sketches, etc.) the operator can comprehend. If the manual(s) and/or basic operating instructions become unavailable due to unusual circumstances (stolen, lost, mutilated, destroyed, etc.) then a deadline for replacement will be established by the designated authority.

- All new (trainee) hoisting operators shall receive at least 40 hours of on-the-job training under direct supervision before being considered qualified to operate hoisting equipment as a licensed operator.

Crawler, Truck, and Wheel Mounted Cranes

- Performance test of crawler, truck, and wheel mounted cranes shall demonstrate the strength, stability, capability, and adequacy of power, brakes, clutches, and controls to safely maneuver 125 percent of the ANTICIPATED load. The stability part of the test may not be required if: the manufacturer's load-rating chart is securely fixed to the operator's cab, there has been no change in the boom or other structural numbers, and there has been no change in counterweight. Stability tests will be conducted in accordance with the SAE recommended Crane Load Stability Test Code - SAE J 765.

- Auxiliary load-handling devices such as buckets, magnets, load falls, slings, load blocks, hoods and pile-driver leads shall be included as part of the load.

- A means shall be provided for the crane operator to visually determine the levelness of the crane.

- A boom angle or radius indicator shall be provided within operator's view.

- All crawler, truck, or locomotive cranes in use shall meet the requirements for design inspection, construction, testing, maintenance, and operation in ANSI B30.5., Safety Code for Crawler, Locomotive and Truck Cranes. All mobile hydraulic cranes in use shall meet the applicable requirements of ANSI B30.15., Safety Standard for Mobile Hydraulic Cranes. (B30.15 is scheduled to be superceded by an updated B30.5). Draglines shall meet Power Crane and Shovel Association Standard #1.

- All jibs shall have positive stops to prevent their movement of more than 50 above the straight line of the jib and boom on conventional crane booms.

- Sideboom cranes mounted on wheel or crawler tractors shall meet the requirements of SAE J 743b.

- Mobile cranes shall not pick or swing loads over the side of the crane unless the outriggers (if so equipped) are down and fully extended.

- Lattice and hydraulic crane equipment shall be equipped with an upper limit device to stop the load hoisting function before the load block or load contacts the boom tip. (See ANSI B30.2).

Material Hoists

- Material hoists shall be designed, constructed, inspected, tested, and maintained in accordance with the Safety Requirements for Material Hoists, ANSI A10.5.

- Towers, shaftways, and cars of material hoists shall be constructed of sound material capable of sustaining the maximum load to be imposed with a factor of safety of at least five.

- Cars or platforms of all hoisting equipment shall be equipped with broken cable safety devices.

- All towers shall rest on solid foundations, be plumb, and well-guyed or otherwise strongly anchored in four directions at the tip and at least every 30 feet in height.

- Hoist platforms of cars shall have all unused sides enclosed and the roof shall be constructed of material strong enough to afford protection from falling objects.

- The roof may be hinged in sections to provide for hoisting of long material.

- Hoist towers shall be enclosed on all sides for their entire height with a wire screen enclosure, formed of not less than No. 18 U.S. gage wire with openings not exceeding 1/2-inch mesh securely fastened to the tower structure, with openings formed onto each floor level.

- Not more than one cage or bucket shall be operated at the same time by any one hoisting machine or operator.

- Each electric motor driven hoist shall have an electro-mechanical automatic motor brake or an electrical device to automatically hold the load in case of power failure.

- Operating rules shall be established and posted at the operator's station of the hoist. Such rules shall include signal system and allowable line speed for various loads. Rules and notices shall be posted on the car frame or crosshead in a conspicuous location, including the statement "No Riders Allowed".

- No person shall be allowed to ride on material hoists except for inspection and maintenance.

- All entrances of the hoistways shall be protected by substantial gates or bars which shall guard the full width of the loading entrance. All hoistway entrance bars and gates shall be painted with diagonal contrasting colors, such as black and yellow stripes.

- Bars at hoistway entrances shall not be less than 2 by 4 inch wooden bars, or the equivalent, located 2 feet; from the hoistway line. Bars shall be located not less than 36 inches nor more than 42 inches above the floor.

- Gates or bars protecting the entrances to hoistways shall be equipped with a latching device.

- The operator's station of a hoisting machine shall be provided with overhead protection equivalent to tight planking not less than 2 inches thick. The support for the overhead protection shall be of equal strength.

- All material hoist towers shall be designed by a registered engineer competent in this field.

Piledrivers

- The width of hulls of floating piledrivers shall not be less than 45 percent of the height of lead above the water. Operating deck of floating piledrivers shall be so guarded as to prevent piles which are being hoisted into driving position from swinging in over the deck.

- Dogs on piledriver hoist drums that automatically disengage either by relieving the load or rotating the drum shall be prohibited.

- All hose connections to piledriver hammers, pile ejectors, or jet pipes shall be securely attached with an adequate length of at least 1/4-inch chain, having 3250 lbs working load limit, alloy steel, or equal strength cable, to prevent whipping if the joint is broken.

- Hanging or swinging leads of piledrivers shall have fixed ladders. Employees shall be prohibited from remaining on leads or ladders while pile is being driven. Fixed leads shall be provided with rings or attachment points so that the aloft worker may engage his/her safety belt lanyard to the leads.

- Fixed Piledriver leads shall be provided with decked landings having guard rails, intermediate rails, and tow boards. Fixed ladders or stairs shall be provided for access the landings and head blocks.

- Landing or leads shall not be used for storage of any kind.

- Piledriver leads shall have stop blocks to prevent the hammer from being raised against head block.

- Pilehammers shall be lowered to bottom of leads while piledriver is being moved.

- Guys, outriggers, thrustouts, counter-balances, or rail clamps shall be provided to maintain stability of piledriver rigs.

- Taglines shall be used for controlling "unguided piles" and "flying hammers".

- Hoisting of steel piling shall be done by use of a closed shackle or other positive attachment that will prevent accidental disengagement.

- If piling cannot be pulled without exceeding the load rating of equipment, a pile extractor shall be used.

- When pulling piling, crane booms shall not be raised more than 600 above the horizontal.

- Piling shall not be pulled by tipping the crane, releasing the load brake momentarily, and catching the load before the crane has settled.

- Overhead protection shall be provided which will not obscure the vision of the operator and shall be the equivalent of 2-inches planking or other material of equivalent strength.

- A blocking device, capable of supporting the weight of the hammer, shall be provided for placement in the leads under the hammer at all times while employees are working under the hammer.

- Guards shall be provided across the top of the head block to prevent the cable from jumping out of the sheaves.

- Steam line controls shall consist of two shutoff valves, one of which shall be a quick-acting lever type within easy reach of the hammer operator.

- When it is necessary to cut off the tops of driven piles, pile driving operations shall be suspended except where the cutting operations are located at least twice the length of the longest pile from the driver.

- All pressure vessels which are a part of, or used with, pile driving equipment shall meet the requirements of the American Society of Mechanical Engineers, Pressure Vessels (Section VIII).

- All employees shall be kept clear when piling is being hoisted into the leads.

- When driving jacked piles, all access pits shall be provided with ladders and bulkheaded curbs to prevent material from falling into the

Overhead Hoists

- The safe working load of the overhead hoist, as determined by the manufacturer, shall be indicated on the hoist, and shall not be exceeded.

- The supporting structure to which the hoist is attached shall have a safe working load equal to that of the hoist.

- The support shall be arranged so as to provide for free movement of the hoist and shall not restrict the hoist from lining itself up with load.

- The hoist shall be installed only in locations that will permit the operator to stand clear of the load at all times.

- All overhead hoists in use shall meet the requirements for construction, design, installation, testing, inspection, maintenance, and operation, as prescribed by the manufacturer.

Elevating and Rotating Work Platforms

- Aerial lifts shall be designed and constructed in conformance with the requirements of the American National Standard for "Vehicle Mounted Elevating and Rotating Work Platforms," ANSI A92.2. Aerial lifts include the following vehicle-mounted aerial devices used to elevate personnel to jobsites above ground: (a) extensible boom platforms, (b) aerial ladders, (c) articulating boom platforms, (d) vertical towers, and (e) a combination of any of the above. Aerial equipment may be made of metal, wood, fiberglass reinforced plastic (FRP), or other material; may be powered or manually operated; and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis.

- Aerial lifts may be "field modified" for uses other than those intended by the manufacturer provided the modification has been certified in writing by the manufacturer or by any other equivalent entity, such as a nationally recognized testing laboratory, to conform with ANSI A92.2 and this section and to be at least as safe as the equipment was before modification.

- Aerial ladders shall be secured in the lower traveling position by the locking device on top of the truck cab and the manually operated device at the base of the ladder before the truck is moved for highway travel.

- Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition.

- Only authorized persons shall operate an aerial lift.

- Belting off to an adjacent pole structure or equipment while working from an aerial lift shall not be permitted.

- Employees shall always stand firmly on the floor of the basket and shall not sit or climb on the edge of the basket or use plants, ladders, or other devices for a work position.

- A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.

- Boom and basket load limits specified by the manufacturer shall not be exceeded.

- When outriggers are used, they shall be positioned on pads or a solid surface and the brakes shall be set. Wheel chocks shall be installed before using an aerial lift on an incline.

- An aerial lift truck shall not be moved when the boom is elevated in a working position with personnel in the basket except for equipment which is specifically designed for this type of operation in accordance with 3.H.01. and 3.H.02.

- Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower level controls shall not be operated unless permission has been obtained from the employee lift, except in an emergency.

- The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value.

- Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position, as provided in 2.H.11.

- All electrical tests shall conform to the requirements of ANSI A93.3. Voltage (d.c.) tests which are approved by the equipment manufacturer or equivalent entity shall be considered an equivalent test.

- The provisions of ANSI A92.2, Section 4.9, Bursting Safety Factor, shall apply to all critical hydraulic and pneumatic components. Critical components are those in which a failure would result in a free fall or a free rotation of the boom. All noncritical Components shall have a bursting safety factor of at least 2.

- All Welding shall conform to the following standards as applicable:

a. Standard Qualification Procedure, AWS B3.0.
b. Recommended Practices for Automotive Welding Design, AWS D8.4.
c. Standard Qualification of Welding Procedures and Welders for Piping and Tubing AWS D10.9.
d. Structural Welding Code AWS D.1.1.

Concrete Equipment

- Handles on bull floats used where they may contact energized electrical conductors shall be constructed of non-conductive material, or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of nonconductive material.

- Powered and rotating concrete troweling machines that are manually guided shall be equipped with a control switch that will automatically shut off the power whenever the operator removes his/her hands from the equipment handles.

- Handles of buggies shall not extend beyond the wheels on either side of the buggy. Installation of knuckle guards on buggy handles is recommended.

- Pumpcrete or similar systems using discharge pipes shall be provided with pipe supports designed with a safety factor of 2. Compressed air hose in such systems shall have positive fail-safe joint connectors to prevent separation of sections when pressurized.

- Concrete buckets equipped with hydraulic or pneumatically operated gates shall have positive safety latches or similar safety devices installed to prevent premature or accidental dumping. The buckets shall be designed to prevent excess aggregate and loose material from accumulating excessively on the top and sides of the bucket.

- Riding on concrete buckets shall be prohibited and vibrator crews shall be kept out from under concrete buckets suspended from cranes or cableways.

- When discharging on a slope, the wheels of ready-mix trucks shall be blocked and the brakes set to prevent movement.

- Nozzle operators applying a cement, sand, and water mixture through a pneumatic hose shall wear protective hand and face equipment.

Overhead and Gantry Cranes

- The rated load of the crane shall be plainly marked on each side of the crane and this marking shall be clearly legible from the ground or floor. If the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block.

- Except for floor-operated cranes, a gong or other effective audible warning signal shall be provided for each crane equipped with a power traveling mechanism.

- All overhead and gantry cranes in use shall meet the requirements for design, construction, installation, testing, maintenance, inspection, and operation in ANSI B30.2, Safety Code for Overhead and Gantry Cranes.

Elevating Work Platforms

- Elevating work platforms not addressed elsewhere in this manual will be designed, constructed, inspected, and operated as prescribed in American National Standard for Elevating Work Platforms - ANSI A92.3.

- Elevating work platforms covered in this sub-section will not be used by persons working on energized electrical wiring and/or equipment.

- Persons selected for operation of elevating work platforms covered herein will be fully fit for the work assignment and thoroughly trained in the safe operation of the work platform by a competent person before they are authorized to operate the work platform.

Procedure Number: 02-415-01

Procedure Name: First Aid and CPR/First Aid Kits

Effective Date: 11-01-91

Supersedes Procedure Number: 14.7, 14.8

Responsible Positions: Operations Manger, Supervisor, Health and Safety Coordinator

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Objective: All MARCOR Supervisors must be trained and recertified annually for both CPR and Basic First Aid.

Certification documents must be forwarded to the Personnel Department and an additional copy must be placed in the Supervisor's personnel file. This certification must be kept up to date and will be incorporated into monthly compliance monitoring and reporting. Certifications shall be from either The American Red Cross or The American Heart Association. Training must include the necessary hands-on training as well as the standard CPR and Basic First Aid Test.

All MARCOR Supervisors must be issued and have on site, an OSHA approved First Aid Kit on their job site within easy access to all employees should a situation arise. All containers must be of the waterproof variety and all items contained therein must be sealed in individually wrapped packages. The kit shall be inspected once a week by the supervisor prior to the start of each job and must be restocked accordingly. The inspection should reveal the quantities of the supplies. If an item is less than half full, restocking must ensue. It is the responsibility of the Supervisor to insure that the contents of the kit are never less than half full.

The First Aid Kit must include the following:

ITEM	SUGGESTED QUANTITY
Bandages (knuckle, fingertip, 7/8" x 3" standard)	100
Burn cream	1 unit
Antiseptic spray or Antibiotic cream	1 unit
Gauze pads	10
Clean wipes	10
Butterfly closures	10
First aid guide	1

The quantities of the supplies shall be sufficient to cover a crew size of 25 employees at a minimum. (The amount of kit's contents are determined by the amount of people it is intended to be used for.)

Other first aid items may be required depending upon chemicals used. The Project Manager and Health and Safety Coordinator are responsible to ensure the proper first aid items are designated for each project.

Procedure Number: 05-460-03

Procedure Name: Occupational Injuries and Unsafe Incidents - Reporting & Investigation

Effective Date: 10/29/97

Supersedes Procedure Number: 05-460-02

Responsible Positions: Assistant Operations Manager, Health & Safety Coordinator, Operations Administrator, Operations Manager, Supervisor, Technician, Warehouse Manager

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Objective: It is the goal of every MARCOR Company to prevent all occupational injuries and illnesses and to make our job sites as safe as possible for our employees. The following procedure and forms are to be used to prevent injuries and save on compensation costs by using our experience as a learning device.

OCCUPATIONAL INJURIES/ILLNESSES

All employees are required to immediately report any occupational injury/illness to their Supervisor. Employees who are not injured during a shift are required to initial the designated area on the Daily Job Report at the end of the shift to indicate that they were not injured. It is the responsibility of the Operations Manager or his/her designee to review the Daily Job Reports to ensure that all employees have initialed the form. For an injured employee, it is the Supervisor's responsibility to indicate the injury by marking the Daily Job Report with either "Injured" or "Yes" in place of the employee's initials. The Operations Manager is responsible for attaching a copy of the completed **Supervisor's Accident Investigation Report** (Form #0546F1) to the Daily Job Report which is submitted to the Payroll Department in Hunt Valley, MD. **The Supervisor's Accident Investigation Report** is discussed in more detail below.

Upon notification or observation of an accident, the Supervisor must first coordinate the appropriate response action and then immediately contact the Operations Manager or his/her designee. At this time, the determination to initiate drug or alcohol screening must be made by the Operations Manager under the guidance of the General Manager. The guidelines in Attachment A are designed to assist in this decision. **(Please note: Post-accident drug or alcohol screening does not apply to the San Francisco office.)**

The Supervisor must complete the **Supervisor's Accident Investigation Report** (Form #05460F1) for injuries to employees that occur on MARCOR job sites or while MARCOR employees are performing job-related duties while off the immediate job site. All work related injuries involving the following **must** be reported to the Operations Manager or his/her designee.

1. Death

2. Loss of consciousness
3. Restriction of work or motion
4. Transfer to another job for lighter duty (including temporary transfer) or
5. Any medical treatment including first aid

The Supervisor must ensure that the **Supervisor's Accident Investigation Report** (Form #05460F1) is completed fully and accurately. If the employee refuses medical treatment, the Supervisor must ensure that the designated area on the form is signed by the injured employee.

SUBCONTRACTORS AND SUBCONTRACTED LABORERS

The Supervisor must complete the **Supervisor's Accident Investigation Report** (Form #05460F1) for injuries to subcontracted laborers or employees of other subcontractors that occur on MARCOR job sites or while performing job-related duties while under contract with MARCOR to perform such duties.

The Operations Manager or his/her designee should be alerted immediately of such incidents. The report should be given to the Operations Manager or his/her designee to conduct an investigation that is independent of the subcontractor's. The Operations Manager or his/her designee is responsible for forwarding the **Supervisor's Accident Investigation Report** completed in conjunction with a subcontracted laborer's/subcontractor's injury to the Human Resources Administrator in Hunt Valley and to the subcontractor's representative. This report is for recordkeeping purposes and is not sent to the Workers' Compensation carrier.

NEAR MISSES

A "near miss" is an incident that could have resulted in injury or property damage. It is MARCOR's policy to document and investigate these incidents in order to learn from them and avoid potentially injurious and costly accidents in the future.

The Supervisor is responsible for completing the **Supervisor's Near Miss/Unsafe Incident Report,** Form #05460F2, and submitting it to the Operations Manager or his/her designee within 48 hours of the occurrence. The purpose of the "near miss" investigation is not to attribute blame, but to take appropriate corrective action and learn from our mistakes before they become problems.

Guidelines for Completion of Reports

To facilitate completion of the report, the Supervisor should ask the injured/involved employee for a verbal, and when feasible, written description of how the accident or injury/"near miss" happened.

Using this, his own observation and information from witnesses, the Supervisor should complete the report thoroughly.

Written statements are helpful for many reasons, a few of which are:

1. to gather and retain accurate information concerning the accident and/or injury/incident;

2. to identify areas where further investigation is necessary;

3. to preserve and authenticate testimony of a witness or an employee (claimant);

Written statements must begin in the upper left hand corner of the page and continue line-by-line with no paragraphs or indentations. Writing in this manner allows for no changes or additions. Each statement should be written in the first person (i.e. I was lifting a barrel when I felt a pulling sensation in my back.). Each page should be numbered and signed by the witness(es) if there are any.

When securing statements from employees and witnesses please keep the following items in mind:

1. Be tactful and sincere while taking this statement. The intent is not to intimidate the witness but rather to elicit his/her cooperation in investigating the incident. Demonstrate that your goal is simply to gather the facts.

2. Statements must be obtained promptly. The more time that is allowed to lapse between the incident and obtaining a statement, the more likely the witness/injured will be influenced by some external force.

3. Ask for a "report," "not a signed statement." Generally, people tend to be intimidated when words like "signed statement" are used. Using a more familiar term like "report" frequently gets faster cooperation.

4. Encourage the witness/injured to be specific when possible. (For example, "I fell off the ladder ten feet (10 feet) to the floor below," rather than "I fell off the ladder."

5. Having obtained a statement from the injured/witness be sure to ask them to sign and date the document.

6. FACTS ONLY! We are only concerned with things that a witness has seen and that

which is reported by the injured. We are not interested in suppositions or conclusions.

7. Lastly, be a good listener. Often important information is missed because we are too busy with other concerns, and the report should only contain that which the injured/involved employee tells us, not what the person writes in his/her statement.

Written statements are a wonderful tool to help investigate workers compensation claims and accidents; however, please be aware that if they are not utilized properly, the process can be counter-productive.

Investigation

Upon receipt of the accident/incident report or verbal notification on an accident or "near miss", the Operations Manager or his/her designee must conduct an investigation involving the Supervisor, the injured/involved employee or subcontracted laborer/subcontractor (if available), and any witnesses to the incident. Guidelines for conducting an investigation are attached in Attachment B.

The investigation should be conducted as soon as possible following the incident, but no later than 24 hours after the Operations Manager receives notification of the incident. The purpose of the investigation is to find facts only and is not intended to place blame on an individual or individuals. Placing blame or inflicting punishment at this point will only be detrimental to the investigation. This is not suggesting that corrective action or discipline is not to be used. It should not, however, affect the investigation and should only be utilized after all facts are obtained.

During the investigation, all causes that led to the incident are to be explored and immediately corrected keeping in mind that the actual accident is usually caused by a sequence of events in which the end result is the injury. Accidents rarely have only one cause. The events that are explored could include a systematic problem (i.e. problems with procedures, training, etc.), a specific work site hazard or a combination of the two.

Upon investigation, the Operations Manager or his/her designee exploring the accident/"near miss" will recommend and implement corrective measures to prevent reoccurrence or avoid an occurrence and document the measures taken on the last page of the **Supervisor's Accident Investigation Report**, Form # 05460F1, before forwarding the document to the Human Resources Department in Hunt Valley. The Operations Manager should apprise the General Manager of his/her findings.

Accident Reporting and Recordkeeping-Additional Guidelines

OSHA and Workers Compensation carrier

In the case of a work related injury or illness involving a MARCOR employee, the Operations Manager or his/her designee, using the information from the **Supervisor's Accident Report**, will complete the **Employer's First Report of Injury** form provided by the insurance carrier if a **workers compensation claim is to be made** to the carrier and also record the data on the OSHA 200 form **if the injury is a recordable injury as defined by OSHA regulations.** (Recordable accidents include all cases that result in death, occupational illness, or injury resulting in loss of consciousness, restriction or work or motion, transfer to another job, or medical treatment other than first aid. NOTE: First aid includes one time treatment and subsequent observation of minor scratches, cuts, burns, etc. which do not ordinarily require medical care even if provided by a physician or registered professional person.) Instructions for completion of the OSHA 200 form are attached.

If a workers compensation claim is to be made, the Operations Manager or his/her designee is responsible for submitting copies of the **Employer's First Report of Injury** to the workers compensation carrier (insurer) and all other pertinent agencies required by law. A copy of the **Employer's First Report of Injury** must also be submitted along with the **Supervisor's Accident Investigation Report** (Form # 05460F1) to the Human Resources Administrator in Hunt Valley, MD.

The Operations Manager or his/her designee is responsible for submitting all subsequent correspondence including medical bills, court dates, etc. to the worker compensation carrier. The claim number should be noted on medical bills to expedite the process.

The Operations Manager or his/her designee is also responsible for completing the OSHA 200 form using the following general guidelines:

1. All recordable cases must be entered on the log within six (6) working days after learning of its occurrence

2. Logs must be maintained and retained in a file in the Operations Manager's or designee's office for at least five (5) years following the end of the calendar year to which they relate

3. Free access to the log must be provided to all employees, present and past, if they so desire

4. A copy of the totals and information following the fold line must be posted in the

location within the division in which notices to employees are customarily posted.

5. The form must be posted no later than February 1 for the previous calendar year's totals and must remain in place until March 1.

6. If no injuries or illnesses are recorded during the year, the form must still be posted and zeros must be entered on the totals line.

7. The Operations Manager or his/her designee who maintained the log must sign the bottom of the form verifying the form's accuracy and completeness.

All above mentioned information must be posted on the OSHA 200 form as well as any additional regulatory guidelines referenced in various state and local jurisdictions. Additionally, this policy must reflect current laws and regulations and must be reviewed and revised in the event of regulatory change.

Routing and Record Retention

Copies of the **First Report of Injury** and the **Supervisor's Accident Report** must be placed in an occupational injury file (kept in the office of the Operations Manager or his/her designee), in the employee's personnel health file and a copy sent to the Human Resources Administrator in Hunt Valley.

A copy of the **Supervisor's Accident Report** must also be attached to the Daily Job Report which was completed for the job where the injury occurred and sent to the Payroll Department in Hunt Valley.

The **Supervisor's Near Miss/Incident Report** should be placed in a central file in a locked filing cabinet kept in the office of the Operations Manager or his/her designee, while a copy should be forwarded to the Human Resources Administrator in Hunt Valley.

Claim Management for Workers Compensation

It is extremely important to keep abreast of the status of the claim, particularly if lost time is involved, by maintaining close contact with the claims representative and the injured employee's physician.

On all lost time injuries, the Operations Manager or his/her designee should contact the physician and make sure that the physician understands the employee's work requirements and ask when the

employee can realistically expect to return to work (target date). The employer should also ask the physician if the employee can perform some adjusted or modified work. If that employee is released by the physician under specified restrictions, a light duty position should be found if at all possible for that employee to perform for the duration of restrictions.

The Operations Manager or his/her designee is responsible for recording all light duty work and coordinating return to regular duty once a medical release authorizing it has been received.

FORM UPDATED: 10/29/97 FORM #05460F3

BASIC RULES FOR ACCIDENT/INCIDENT REPORTING AND INVESTIGATION

1) Gather and retain accurate information concerning the accident and injury or incident. Ask the employee for a verbal, and when feasible, a written description of how the accident or incident happened. **Ask open-ended questions** (e.g., "What happened exactly?" instead of "This is what happened, right?"

2) Use personal observation and information from witnesses to complete the report thoroughly.

3) Be tactful and sincere when taking statements from employees and witnesses. The intent is not to intimidate the witness but rather to elicit cooperation in investigating the accident or incident.

4) Statements should be obtained promptly while facts are still fresh.

5) If possible and feasible, "walk through" the accident or incident with the employee involved in order to re-enact the occurrence. But, **do not** jeopardize the health of either the employee or other witnesses in order to do this.

6) Ask for a "report", not a "signed statement." Generally, people tend to be intimidated when words like "signed statement" are used. Using a more familiar term like "report" frequently gets faster cooperation.

7) Encourage the witnesses/injured to be specific when possible (For example, "I fell off the ladder ten feet (10 feet) to the floor below, rather than "I fell off the ladder.")

8) Having obtained a statement from the injured/witnesses, be sure to ask them to sign and date the document.

9) **FACTS ONLY!** We are only concerned with things that a witness has seen and that which is <u>reported</u> by the injured. We are not interested in suppositions or conclusions.

10) If possible, document details graphically with sketches or diagrams.

11) If a third party or defective product contributed to the accident, document this as well.

12) Include an action plan to prevent such accidents or incidents in the future.

13) Lastly, be a good listener. Often, important information is missed because we are too busy with other concerns. The Supervisor's Accident/Incident Report should only include that which the employee tel us, not what the injured or involved employee writes in his/her statement.

(These basic rules should be attached to forms #05460F1 and #05460F2 to aid supervisors when reporting accidents and unsafe incidents.)

Attachment A - Post Accident Drug or Alcohol Screening Guidelines
(Does not apply to the San Francisco Office)

These guidelines are designed to aid the Operations Manager in determining whether or not to initiate drug and/or alcohol screening for an employee who has been involved in an accident/injury arising from or during the course of employment for MARCOR. After evaluating the incident, if the Operations Manager has affirmed one or more of the following questions, drug and/or alcohol screening may be initiated.

1) Does the possibility exist that the employee's performance contributed to the accident/injury or cannot completely be ruled out as a contributing factor to the incident?

2) Did you observe specific behavior that may indicate drug abuse or alcohol misuse?

3) Did you receive information from witnesses that saw a specific event or behavior that may indicate drug abuse or alcohol misuse? If so, how far away were the witnesses? What exact behavior did they see and when?

Attachment B - Accident Investigation Guidelines

The guidelines below are designed as an aid to the Operations Manager or his/her designee in conducting successful accident investigations:

1) Conduct the investigation as soon as possible after the incident has occurred.

2) Identify the people involved in the accident.

3) Interview witnesses separately and as soon as possible after the accident. Interview witnesses that: saw the event leading up to the accident; saw the accident occur; and who arrived on the screen immediately after it occurred.

4) When conducting interviews look for facts not fault. Ask open ended, non-leading questions. Re state the questions to determine the accuracy of response.

5) Determine answers about these factors:

The Injured Person:
- Did the person have proper work instructions?
- Did the person have the requisite experience for the job?
- Did the person have the skill level to do the job?
- Was the person experiencing fatigue, sickness, emotions or attitudes that would impact his/her work?

The Equipment, Machines and Materials:
- Was the equipment adjusted, calibrated and properly guarded?
- Was the equipment in good working order when it arrived on the job?
- Was the right equipment for the job being used?
- Was the equipment properly maintained?
- Were proper materials handling procedures in use?
- Was the equipment readily available?
- Was the equipment designed correctly?

The Location and Environment:
- Did the work area have appropriate lighting and temperature?
- Did smoke, vapors or noise contribute in any way?
- What was the floor surface like?

The Method of Work:
- Did the employee use the correct work procedures?
- Was the employee using personal protective equipment provided?

Other Factors:
- Were other persons involved?
- Were unusual job conditions involved? Was it a rush job? Was the work crew short-handed?

FORM UPDATED: 10/29/97 FORM # 05460F2

SUPERVISOR'S NEAR MISS / UNSAFE INCIDENT REPORT
& POTENTIAL LOSS SOURCE IDENTIFICATION

*This must be filled out and forwarded to the Operations Manager within 48 hours of the incident.

When

Date of Incident:_____ Time:_____ AM or PM

Job Start Time:_____ AM or PM

Report to supervisor delayed? Yes ____ No _____ If yes, why?_____

_____

_____

Who

Involved Person's Name:_____

Job Title:_____ Length of Employment:_____

MARCOR Office:_____

Names of any witnesses:_____

_____

Date of Last Tailgate Safety Meeting & Name of Conducting Supervisor:_____

_____

Where

Job Number, Name, Address (Include county):_____

_____

Exact Location of Incident:_____

SUPERVISOR'S NEAR MISS / UNSAFE INCIDENT REPORT
& POTENTIAL LOSS SOURCE IDENTIFICATION

Potential Injury / Loss

Nature of the potential injuries and/or property damage

_____

_____

What Body part could have been injured: _____

Did employee lose time on job due to incident and how much time?

_____

Did coworkers lose time on job due to incident and how much time? _____

What / How

Type of potential accident (use code on page 3) Injury (1-10) _____

Type of potential property damage (1-4) _____

What work was being done ? _____

How often is this job performed by person involved? _____

Was individual doing something other than required duties at time of incident?

Yes _____ No _____ If yes, what and why? _____

_____

Description of incident (detail what individual was doing; how he/she was doing it; what he/she was wearing and any physical objects (including structures, equipment, tools, materials being handled, machines) involved.

_____

_____

_____

SUPERVISOR'S NEAR MISS / UNSAFE INCIDENT REPORT
& POTENTIAL LOSS SOURCE IDENTIFICATION

Why

Check potential causes on page 4 and comment fully on how an accident may have occurred, include mechanical defects or unsafe acts that could have contributed.

_____

_____

Prevention

What should be done and by whom to prevent this type of incident from potentially becoming an accident?
Include target dates for completion.

_____

_____

_____

What action are you taking to see that this is done? Include target dates for completion.

_____

_____

Supervisor's Signature:_____

Date:_____

Incident Codes:

POTENTIAL INJURY

1. Fall from elevation
2. Fall same level
3. Struck by
4. Caught in, under, or between
5. Overexertion (push/pull, lift/lower, carry/hold)
6. Cumulative trauma disorder
7. Electrical contact
8. Fumes, dust, gas, caustics, noise, etc.
9. Motor vehicle
10. Other (describe)_____

POTENTIAL PROPERTY DAMAGE

1. Fire or explosion
2. Collapse
3. Rupture or bursting
4. Collision or overturn

SUPERVISOR'S NEAR MISS / UNSAFE INCIDENT REPORT & POTENTIAL LOSS SOURCE IDENTIFICATION

Cause Analysis (check all that apply):

ENVIRONMENTAL

___ Inadequate Safeguards
Lack of handling or safety devices: unsafe design: unguarded machinery, etc.

___ Improper or Defective Equipment

___ Location Hazards
Poor layout: congestion; insufficient space; poor lighting, etc.

___ Poor Ergonomics
Heavy lifting, excessive bending, etc.

___ Poor Housekeeping

___ Not otherwise classified

PERSONAL

___ Bodily Conditions
Physical impairment; illness; fatigue; emotional factors; etc.

___ Lack of Skill or Knowledge

___ Failure in Execution
Properly trained but chance-taking, unauthorized or unnecessary use of equipment

___ Improper Apparel/PPE

___ Not otherwise classified

Comments by Operations Manager and Loss Control/Health & Safety Chairperson:

Based on the Supervisor's report, a concise statement commenting on who (department/occupation) was involved; what equipment, tools, etc. were involved; how, where and why the incident occurred; and whether the suggested corrective action is complete enough to prevent an occurrence.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Health & Safety/Operations Manager's Signature:_____

Date:_____

Loss Control/H & S Committee Chair's Signature:_____

Date:_____

FORM UPDATED: 10/29/97 FORM # 05460F1

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT
& LOSS SOURCE IDENTIFICATION

*This must be filled out and forwarded to Liberty Mutual within 12 hours of the incident.

When

Date of Accident:_____ Time:_____ AM or PM

Job Start Time:_____ AM or PM

Report to supervisor or first aid delayed? Yes ____ No _____ If yes, why?_____

_____

_____

_____

Received medical treatment Yes _____ No _____ Date Received:_____

Refused medical treatment Yes _____ No _____ (If yes, employee must review and sign statement below.)

I acknowledge that I have been informed of my right to receive medical treatment for injuries relating to this accident and am refusing medical treatment. I hereby release MARCOR Remediation, Inc. and its agents and affiliates from any ill effects which may result from this action.

_____ _____
Employee's Signature Date

Name, Address, Phone Number of Medical Facility:_____

_____

_____

_____

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT
& LOSS SOURCE IDENTIFICATION

Who

Injured Person's Name:_____ DOB:_____

SSN#:_____ Phone #:_____

Home Address:_____

Date of Marriage:_____ # of children under 18 _____

Job Title:_____ Length of Employment:_____

MARCOR Office:_____

Names of any witnesses:_____

Date of Last Tailgate Safety Meeting & Name of Conducting Supervisor:_____

_____

Where

Job Number, Name, Address (Include county):_____

_____

Exact Location of Accident:_____

Injury / Loss

Nature/extent of injuries and/or property damage

_____

_____

Injured Body Part:_____

Time employee lost on job due to accident_____

Time coworkers lost because of accident _____

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT
& LOSS SOURCE IDENTIFICATION

What / How

Type of accident (use code on page 4) Injury (1-10) _____ Property Damage (1-4) _____

What work was being done ?_____

How often is this job performed by injured?_____

Was employee doing something other than required duties at time of accident?

Yes _____ No _____ If yes, what and why?_____

_____

_____

Description of accident (detail what employee was doing; how he/she was doing it; what employee was wearing and any physical objects (including structures, equipment, tools, materials being handled, machines) involved.

_____

_____

_____

_____

Why

Check accident causes on page 4 and comment fully on why the accident occurred, and mechanical defects or unsafe acts contributing to the accident.

_____

_____

_____

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT & LOSS SOURCE IDENTIFICATION

Prevention

What should be done and by whom to prevent recurrence of this type of accident? Include target dates for completion.

_____

_____

_____

What action are you taking to see that this is done? Include target dates for completion.

_____

_____

Supervisor's Signature: _____

Date: _____

Accident Codes:

INJURY

1. Fall from elevation
2. Fall same level
3. Struck by
4. Caught in, under, or between
5. Overexertion (push/pull, lift/lower, carry/hold)
6. Cumulative trauma disorder
7. Electrical contact
8. Fumes, dust, gas, caustics, noise, etc.
9. Motor vehicle
10. Other (describe)_____

PROPERTY DAMAGE

1. Fire or explosion
2. Collapse
3. Rupture or bursting
4. Collision or overturn

Accident Cause Analysis (check all that apply):

ENVIRONMENTAL

___ Inadequate Safeguards
Lack of handling or safety devices; unsafe design; unguarded machinery, etc.
___ Improper or Defective Equipment
___ Location Hazards
Poor layout; congestion; insufficient space; poor lighting, etc.
___ Poor Ergonomics
Heavy lifting, excessive bending, etc.
___ Poor Housekeeping
___ Not otherwise classified

PERSONAL

___ Bodily Conditions
Physical impairment; illness; fatigue; emotional factors; etc.
___ Lack of Skill or Knowledge
___ Failure in Execution
Properly trained but chance-taking, unauthorized or unnecessary use of equipment
___ Improper Apparel/PPE
___ Not otherwise classified

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT
& LOSS SOURCE IDENTIFICATION

Comments by Operations Manager or his/her designee and Loss Control/Health & Safety Chairperson:

Based on the Supervisor's report, a concise statement commenting on who (department/occupation) was injured; what equipment, tools, etc. were involved; how, where and why the injury occurred; and whether the suggested corrective action is complete enough to prevent recurrence.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Health & Safety/Operations Manager's Signature:_____

Date:_____

Loss Control/H & S Committee Chair's Signature:_____

Date:_____

Procedure Number: 02-332-01

Procedure Name: Equipment Safety Guidelines - Electric, Gas, Diesel & Pneumatic Powered Equipment

Effective Date: 11-01-91

Supersedes Procedure Number: New

Responsible Positions: Supervisor, Technician, Warehouse Manager, Operations Manager, Assistant Operations Manager, Health & Safety Coordinator

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Objective: To establish guidelines for the proper use of electric, gas, diesel and pneumatic powered equipment.

General

- Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition. Records of tests and inspections shall be maintained at the site by the contractor, shall become part of the official project file, and shall be made available upon request of the designated authority.

- The employer shall designate a competent person to be responsible for the inspection of all machinery and equipment daily and during use to make sure it is in safe operating condition. Tests shall be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition.

- Preventive maintenance procedures recommended by the manufacturer shall be followed.

- Any machinery or equipment found by the contractor or designated authority to be unsafe shall be deadlined and its use prohibited until unsafe conditions have been corrected. A tag indicating that the equipment shall not be operated nor the tag removed shall be placed in a conspicuous location on the equipment. The tag shall remain until it is demonstrated to the individual deadlining the equipment that it is safe to operate. Where possible, lockout procedures shall be used.

- Inspections or determinations of road conditions, parking lots, and structures shall be made in advance to assure that clearances and load capacities are safe for the passage or placing of any machinery or equipment.

- Machinery and mechanized equipment shall be operated only by designated personnel. Equipment deficiencies observed at any time that affect their safe operation shall be corrected before continuing operation.
- Seats or equal protection must be provided for each person required to ride on equipment.
- Getting off or on any equipment while it is in motion is prohibited.
- Machinery or equipment requiring an operator shall not be permitted to run unattended.
- Machinery or equipment shall not be operated in a manner that will endanger persons or property nor shall the safe operating speeds or loads be exceeded.
- All machinery or equipment shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Exemption: Equipment designed to be serviced while running.
- All repairs on machinery or equipment shall be made at a location which will provide protection from traffic for repairpersons.
- Heavy machinery, equipment, or parts thereof which are suspended or held apart by slings, hoist, or jacks also shall be substantially blocked or cribbed before personnel are permitted to work underneath or between them.
- Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.
- Equipment operated on the highway shall be equipped with turn signals visible from the front and rear.
- All machinery or equipment and material hoists operating on rails, tracks, or trolleys shall have positive stops or limiting devices either on the equipment, rails, tracks, or trolleys to prevent overrunning safe limits.